THE
RAILWAY GAZETTE

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On Sentinel Locomotives at a Steelworks

This illustration shows two of a fleet of Sentinel locomotives in use at the Middlesbrough works of Dorman Long & Co. Ltd.

In the foreground is one of the 207 H.P. 0-4-0 locomotives and the one on the embankment is a 283 H.P. 0-6-0 locomotive.

Timken axleboxes are fitted to all axles of these two designs of Sentinel locomotive.

British Timken, Duston, Northampton, Division of The Timken Roller Bearing Company. Timken bearings manufactured in England, Australia, Brazil, Canada, France and U.S.A.

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NOSE SUSPENSION

FOR AXLE-HUNG TRACTION MOTORS

Solving the complex problem of nose-suspension, Metalastik designs provide as much vertical deflection as required and enough flexibility to accommodate without frictional wear or noise all relative horizontal pitching and rolling movement of the motor and bogie transom. In general they may be divided into two main classes: those in which lateral thrust is taken by the axle sleeve bearings or other means and types with chevron-shaped rubber springs which resist lateral thrust.

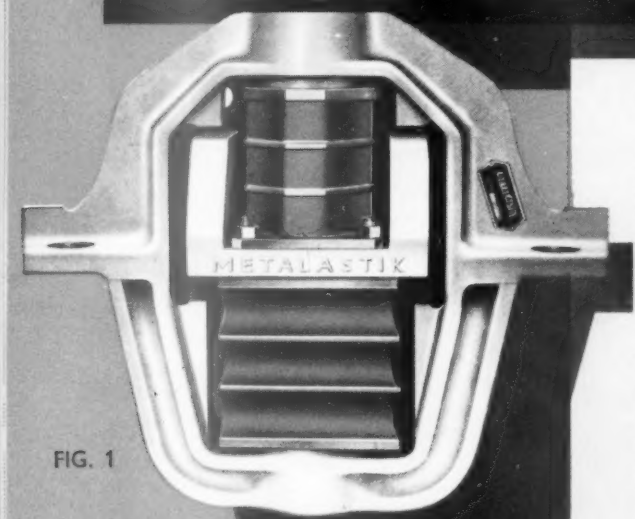

FIG. 1

The suspension in Fig. 1 has little lateral stiffness and a 400 h.p. motor on this design can be moved easily from side to side within the end play of its sleeve and axle bearings.

Fig. 2 shows a Crompton Parkinson motor with chevron-type nose suspension which has high resistance to relative transverse movement (due to compression of the rubber) but little resistance to rolling and tipping of the motor. The lower arms of the chevrons also carry the static weight of the motor nose and they are longer than the upper arms for this reason.

The chevron-suspension in Fig. 3 is for an A.E.I. (B.T.H.) motor. The upper arms of the chevrons are longer than the lower arms in this design as the direction of the static load is reversed.

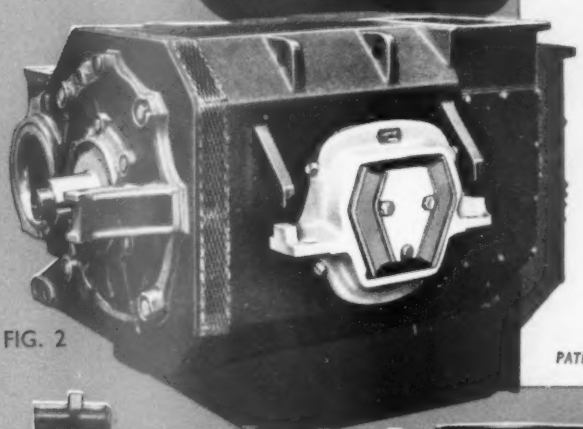

FIG. 2

PATENTS

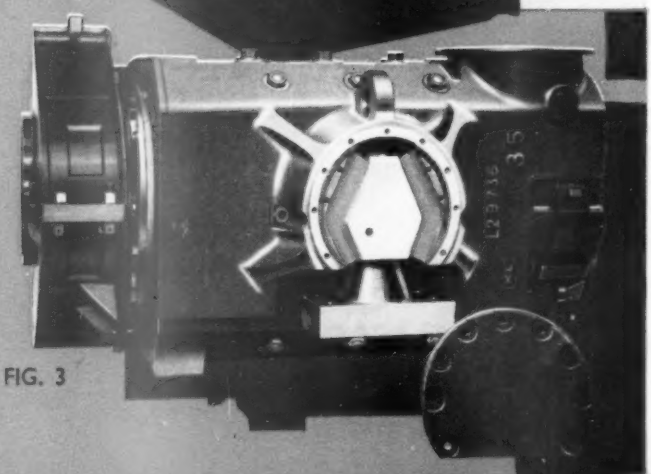

FIG. 3

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The illustration shows a Pearson Electro Hydraulic Guillotine Shear of 6'-0" x ⅜" M.S. Capacity installed at the works of Dominion Bridge Co., Regina, Saskatchewan.

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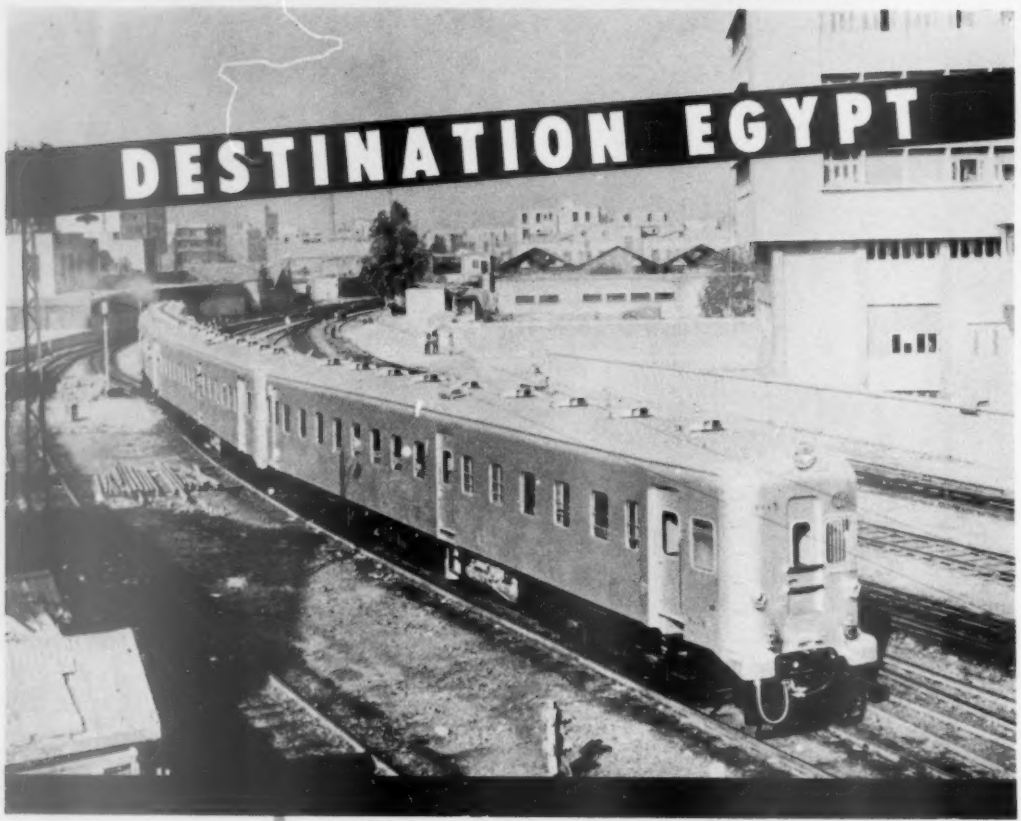

1. Gauge of track .....
   4 ft. 8½ in. (1,435 mm.)
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The first 20 units of 350 Diesel-powered cars for the Egyptian Railway, U.A.R., were completed in January 1960 at Hitachi's Kasado Works. Up to October 1960, 90 cars have been delivered in total and these cars are now in their service operation with complete satisfaction of the customer.

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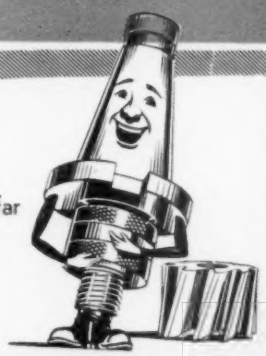
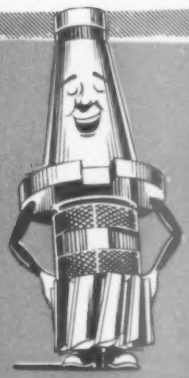
FIRST STAGE

Screw on the nut by hand—as far as it will go.



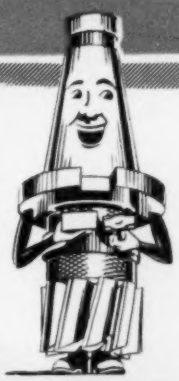
SECOND STAGE

Screw on the cutter to meet the nut—then release by a part reverse turn.



THIRD STAGE

Screw back the nut firmly against the cutter by hand—immediately cutting starts the cutter will lock solidly against the nut, making a rigid tool assembly.



TO RELEASE

Apply the spanner to the nut and a few sharp hammer blows will release the nut from the cutter, which can then be screwed off by hand."

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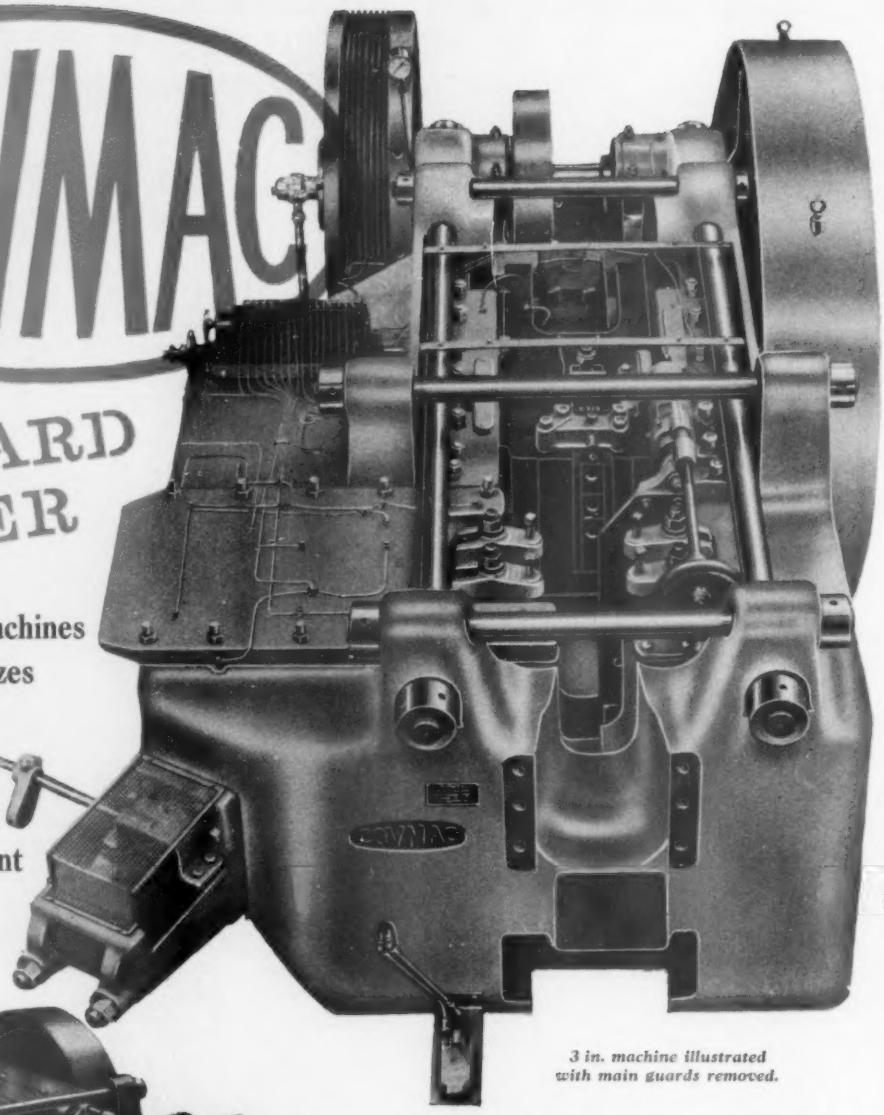
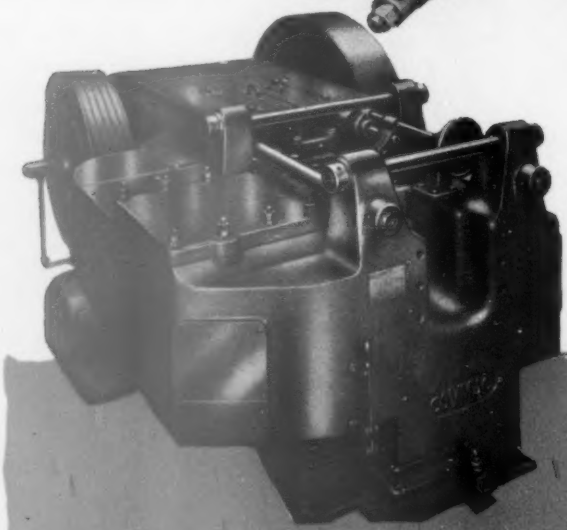


3 in. machine illustrated with main guards removed.



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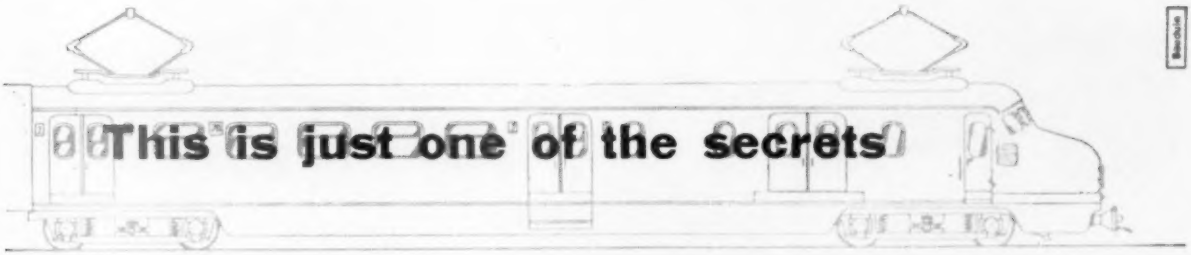
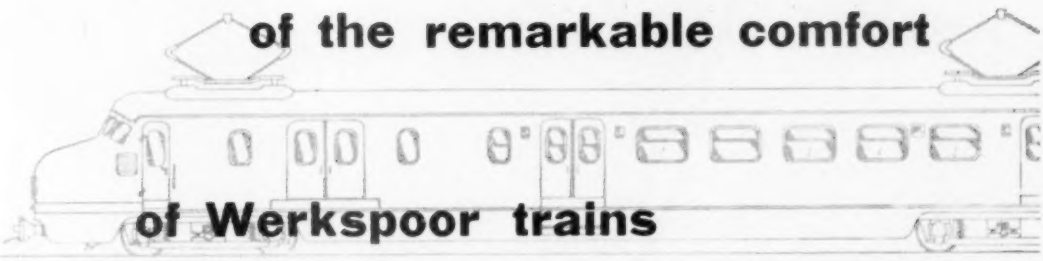
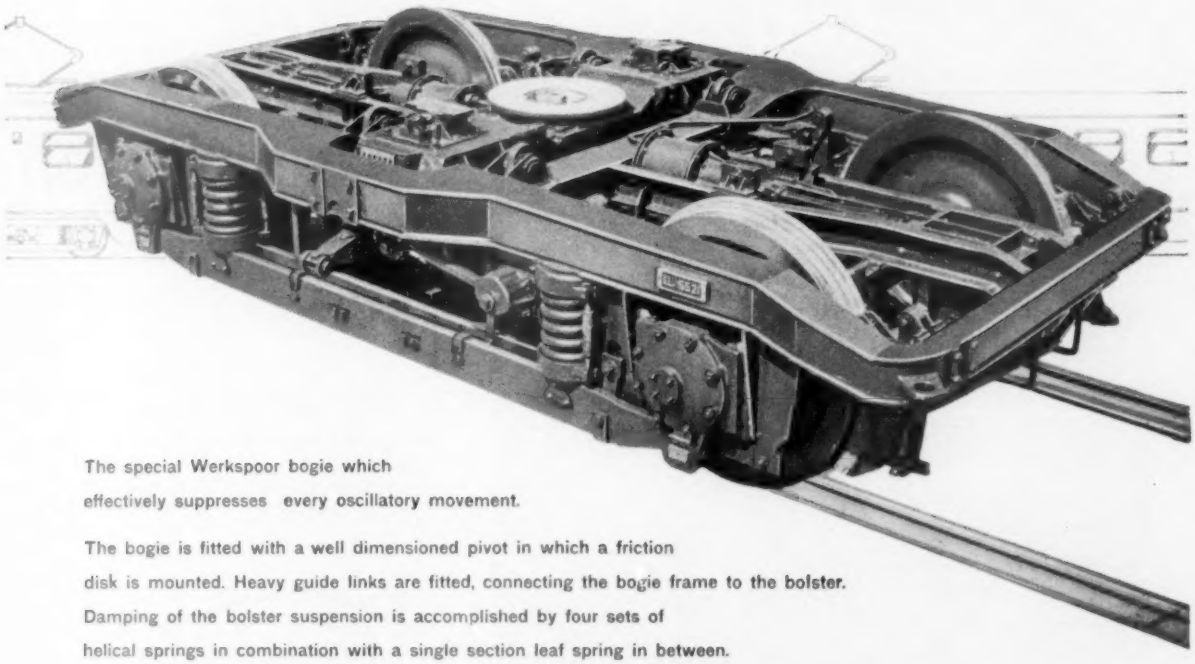


This is just one of the secrets



of the remarkable comfort of Werkspoor trains



The special Werkspoor bogie which effectively suppresses every oscillatory movement.

The bogie is fitted with a well dimensioned pivot in which a friction disk is mounted. Heavy guide links are fitted, connecting the bogie frame to the bolster. Damping of the bolster suspension is accomplished by four sets of helical springs in combination with a single section leaf spring in between.

An additional factor contributing to the comfort of WERKSPOOR trains is the perfect **sound insulation.** Another important feature of Werkspoor trains is the high **safety factor,** the all-welded steel structure of the cars proved to possess excellent protective qualities for passengers and train crew.

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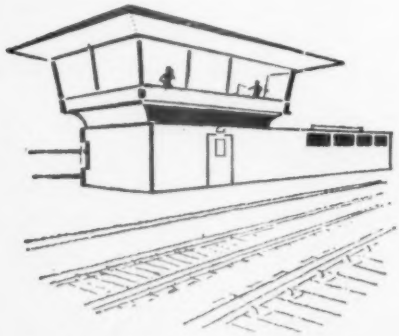

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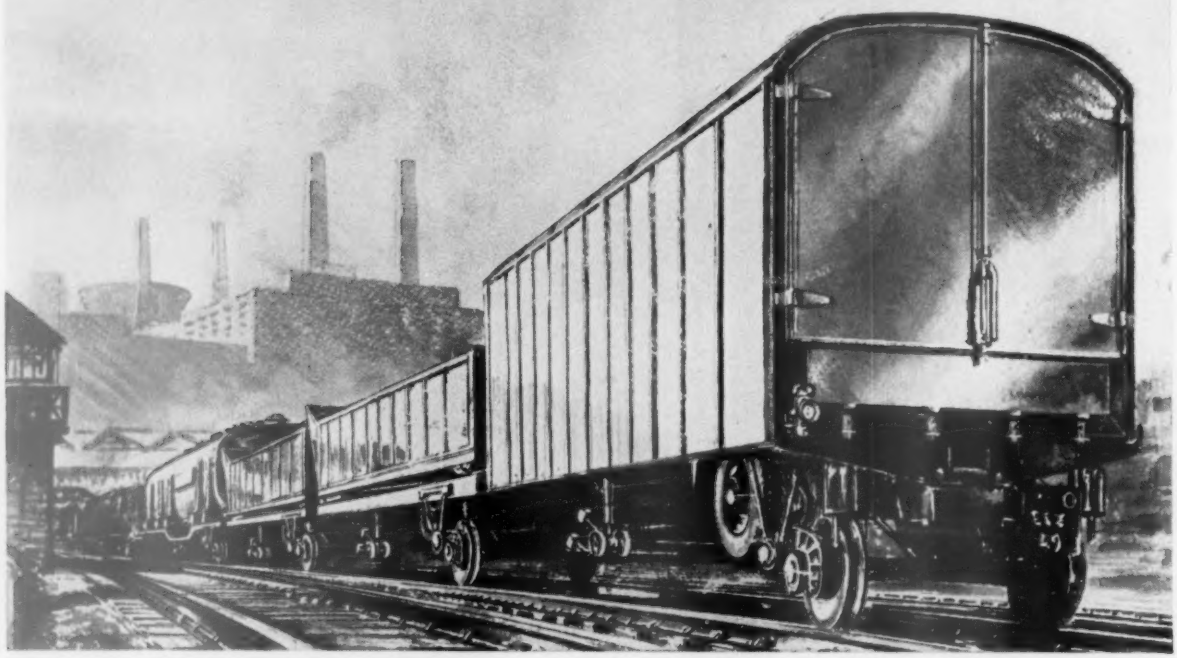

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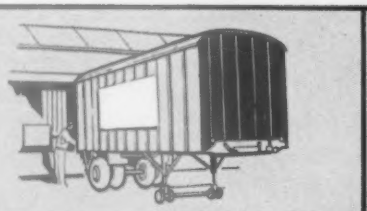
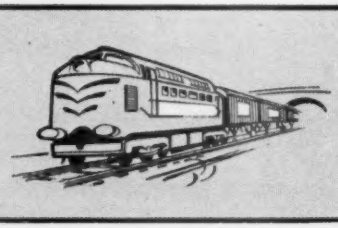
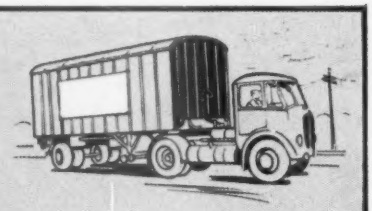


1 The Roadrailer, loaded at the factory as an ordinary articulated lorry.



2 The Roadrailer as part of a fast freight train.



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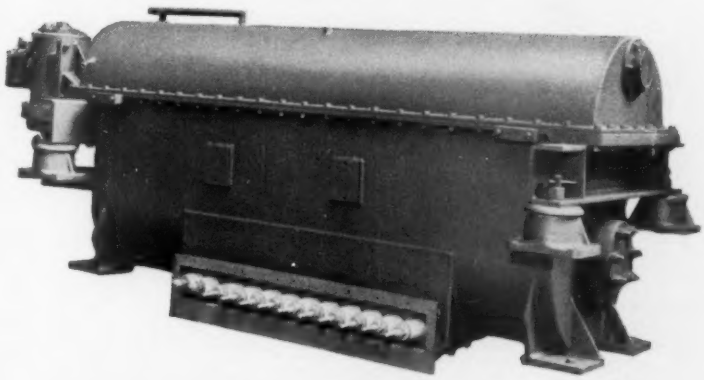
The G.E.C. 1,000 kVA transformer and two reactors (as shown here) are carried on Silentbloc anti-vibration mountings. These motor coaches provide the power for 3 or 4 coach multiple-unit trains on the Eastern Region Suburban lines.



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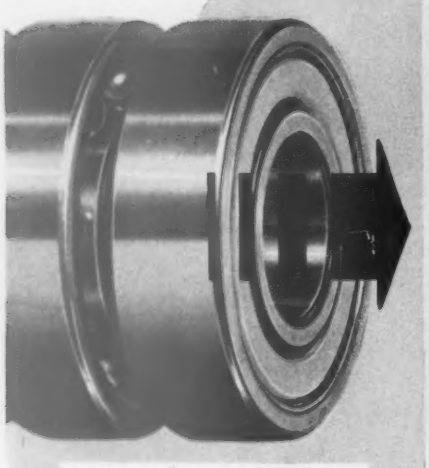
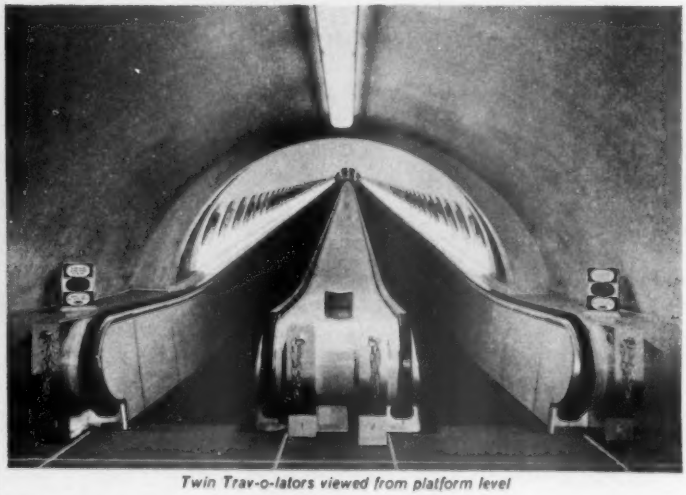
There are two Trav-o-lators, one for up and the other for down travellers, and so we can say, with pleasure, that there are nearly 8,000 Hoffmann bearings down "The Drain"



Straightforward, easy-to-fit Hoffmann bearings with shields to retain lubricant, were specified for this job, to ensure dependability, efficiency and smoothness of movement, the prime features in applications of this nature.



Twin Trav-o-lators viewed from platform level

Photograph by kind permission of Otis Elevator Company Limited.

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BALL AND ROLLER BEARINGS

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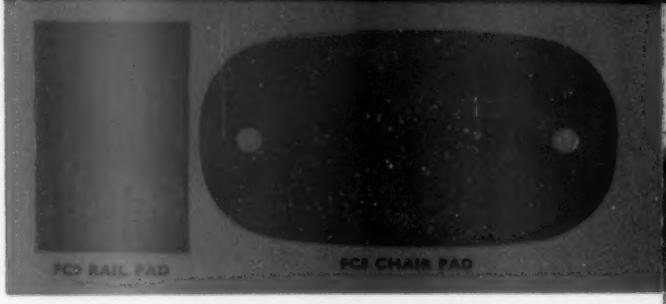

Photographs by courtesy of British Railways

Appreciating the tremendous punishment meted out to the permanent way Walker's, in close co-operation with Permanent Way Engineers, have pioneered and developed a range of special Bonded Cork Pads for concrete sleepers, longitudinal bridge timbers, points and crossings, high speed curves, diesel pit installations, bridge bearers, electric signal insulation, etc.

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For use between baseplates or chairs, and softwood sleepers

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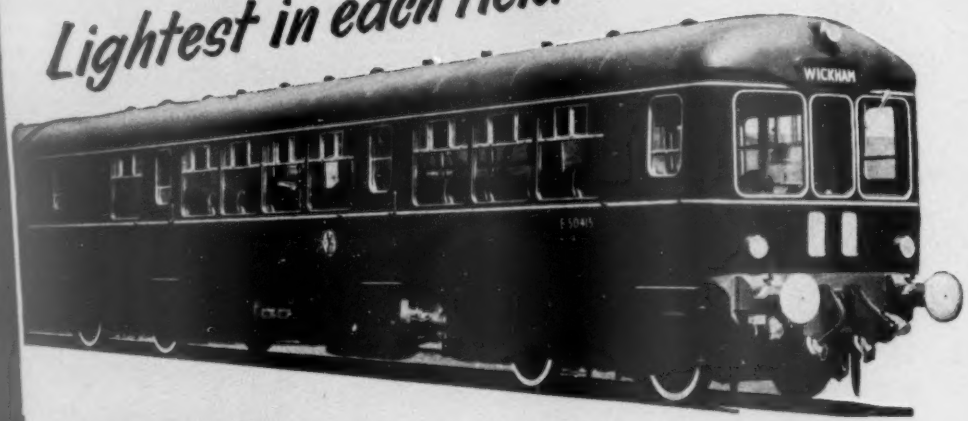
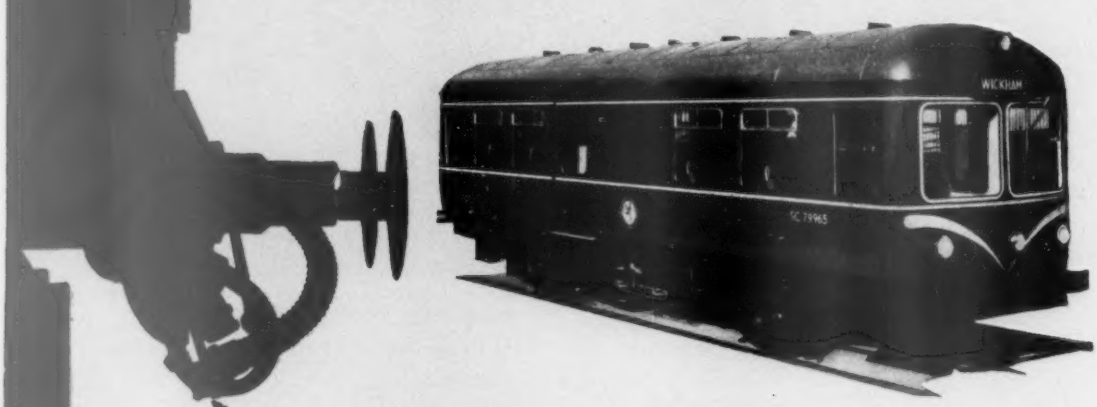


because —

stressed body construction as used in these cars provides the lightest and strongest type of coach. The Wickham method of tubular construction has now given over twenty years, successful service under exceptionally severe conditions in many parts of the world.



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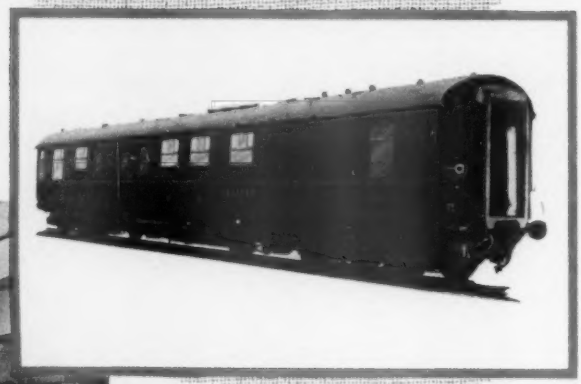
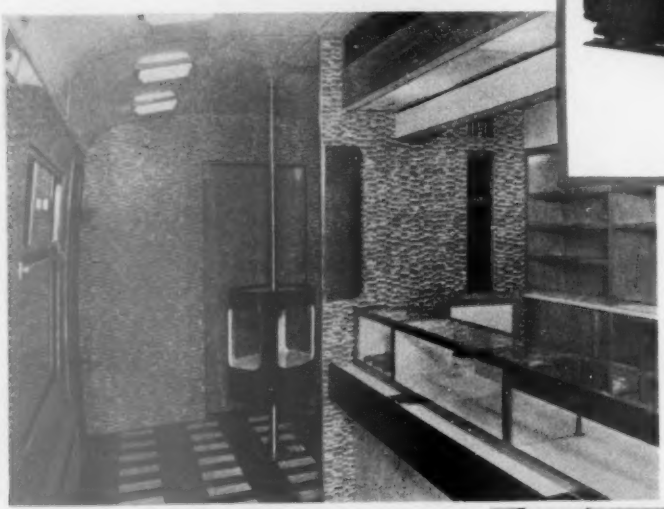
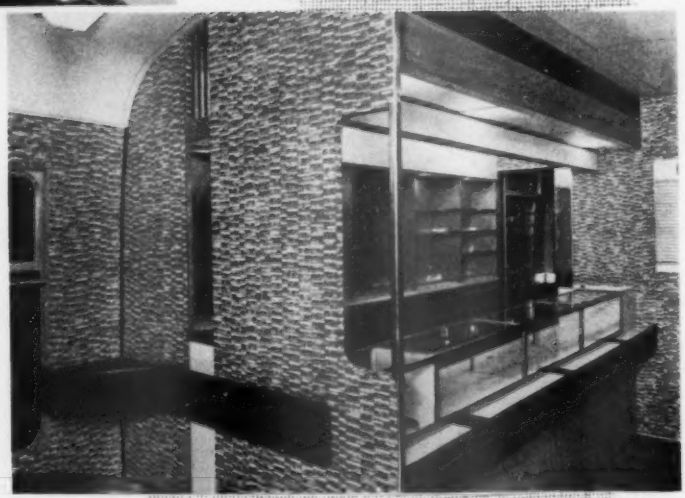
Buffet Cars for BRITISH RAILWAYS







This is one of 53 new kitchen-buffet, cars on order for British Railways. The buffet kitchen, pantries and staff quarters incorporate many original features enhancing efficiency, cleanliness, comfort and appearance. Cravens make all types of rolling stock for the railways of today.

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..."It's easily the best general purpose electrode available."

"Fastex 5" is easily the best general purpose electrode available because it is fast in operation and produces neat and regular welds; it is smooth running and produces slag which is easy to remove; its high quality is consistent; it is designed for downhand welding, and it can be used in other positions; it is suitable for an extensive range of general purpose work and for a wide variety of mild steels. In short, "Fastex 5" is the best electrode for most jobs.

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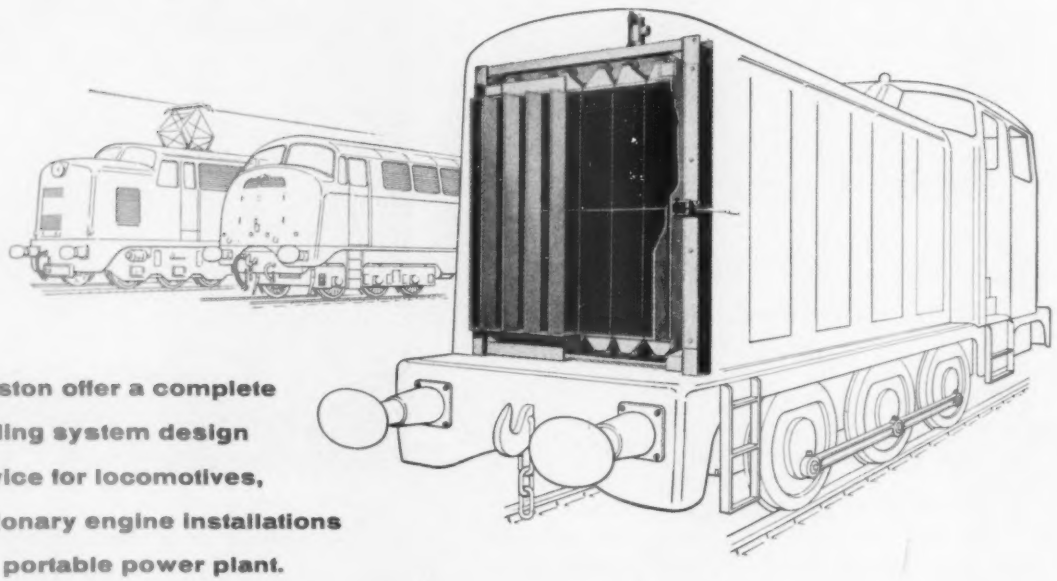
For all locomotives— Marston element-type radiators

Long experience of heat-transfer problems, advanced techniques and a comprehensive design service make Marston element-type radiators the best of their kind for locomotive service. By combining several elements, one of these robust, efficient cooling units will deal with heat from several sources—for example, engine coolant, lubricating oil and transmission fluid.

* Interchangeable elements simplify servicing.
* Choice of light-alloy or copper/brass elements.
* Resistant to impact loads, vibration and thermal shock.
* Built to withstand high internal pressures.



Marston offer a complete cooling system design service for locomotives, stationary engine installations and portable power plant.

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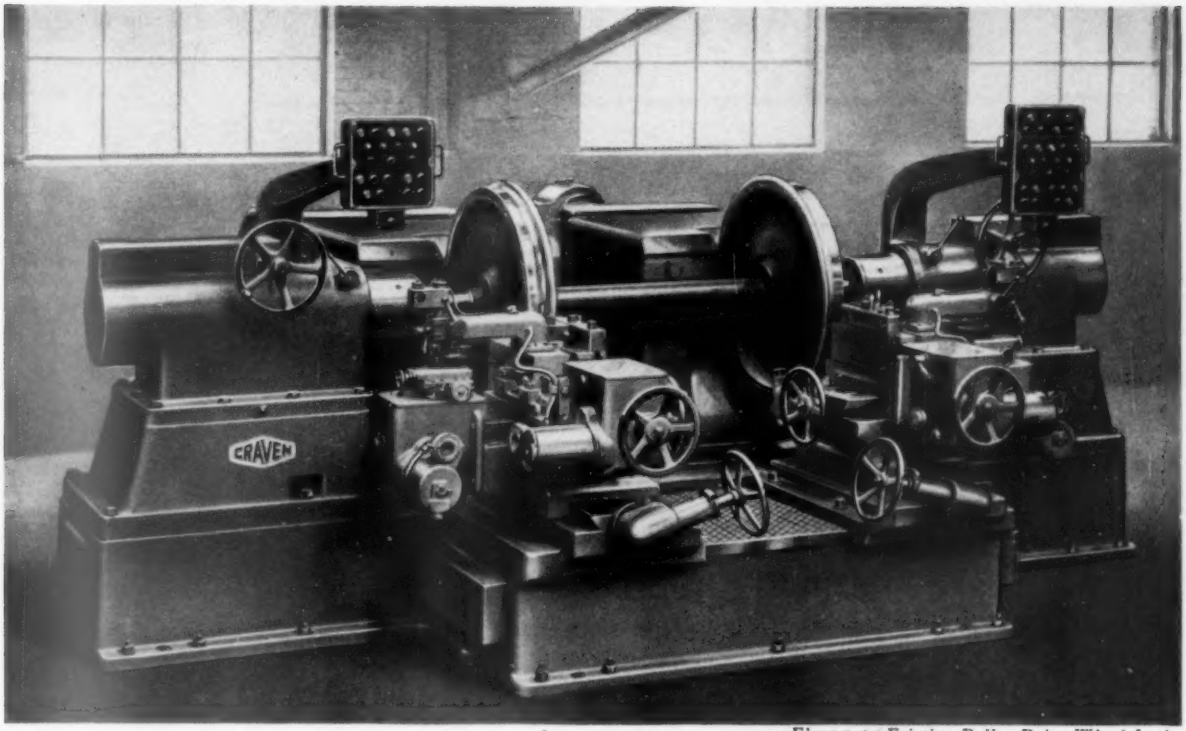

Floor-type Friction Roller Drive Wheel Lathe

FLOOR-TYPE AND PIT-TYPE

WHEEL LATHES

WITH FRICTION ROLLER DRIVE AND ELECTRICAL PROFILING

Recent developments in Craven Railway Wheel Lathes utilise carbide tools for re-turning diesel and electric traction wheels. The floor-type lathe deals with dismantled wheel sets, either with or without their axleboxes in position: the pit-type lathe re-turns wheel sets in position on the vehicle. The drive is by two pairs of hydraulically-loaded friction rollers—one pair to each wheel—giving a balanced, self-contained thrust upon the wheel rims to transmit a high driving torque without risk of distortion. Tread and flange form profiling is by Craven patent fully-automatic, single-point electrical profile copying equipment.

Patent Nos. 849291 & 833326,
and application No. 29749/59.

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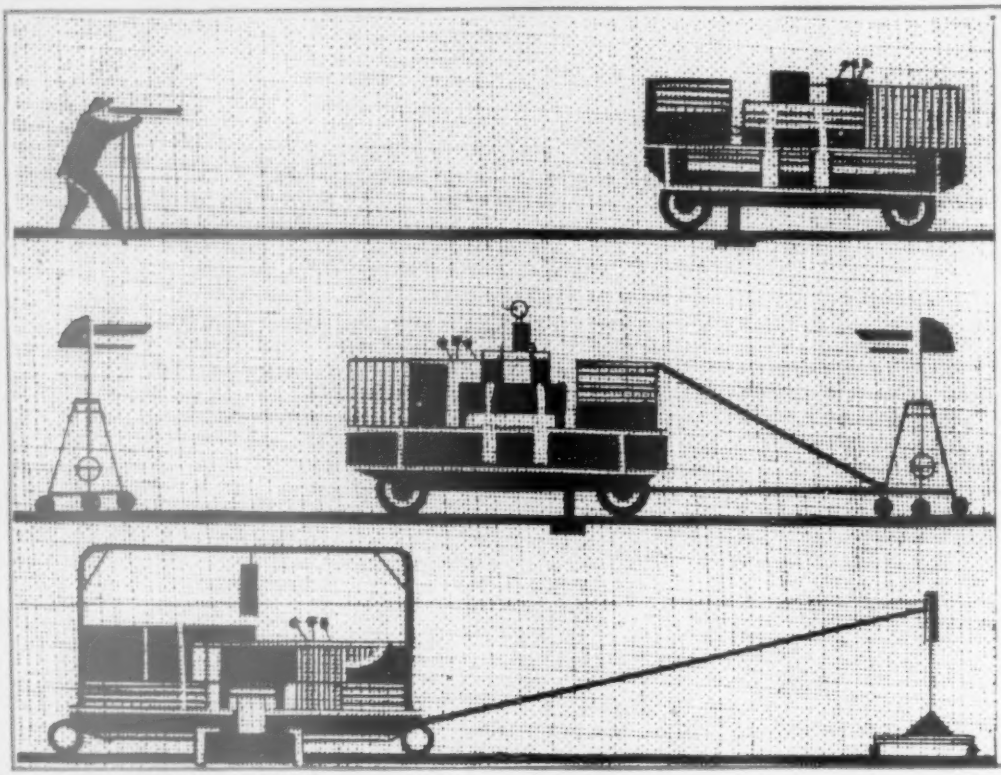


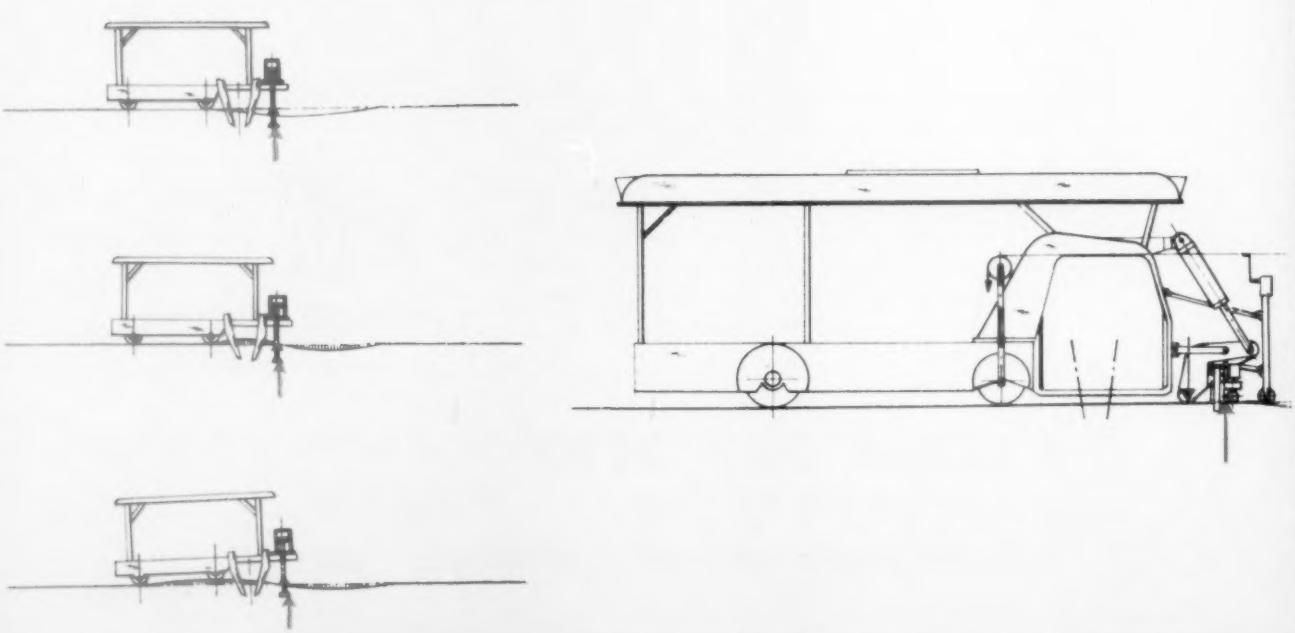
1955
Sighting by means of theodolite.

1959
Electrical beam system demonstrated at Maintenance of Way Exhibition, March, 1959.

1960
Wire sighting method by means of only one sighting wire.

1961

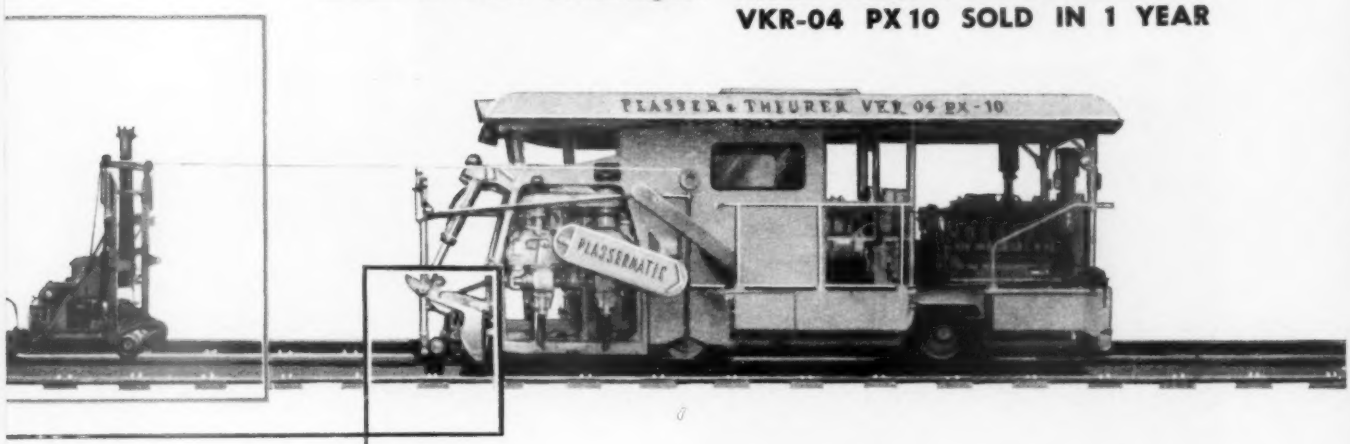
The Plasser and Theurer sighting method by means of the wire levelling device SNG 40 is the result of experience throughout many years. This was preceded by tests with all sighting possibilities known thus far—light ray method and wire levelling included. The Plasser and Theurer method has proved to be superior to all other methods as it guarantees a smooth working at a fool-proof operation.
Production increase by Plassermatic with self-propelled distant-controlled dolly (1-man-operation).
Cross level automatically established.



Why Plassermatic?

1. High point method guarantees a proper track position even in super-elevation ramps. (Patent pending).
2. Rail bending compensator by knee-lever guarantees proper longitudinal level. (Patent pending).
3. Performance up to 1,150 ft./h.
4. With self-propelled, distant-controlled front bogie, 1-man-operation. (Patent pending).
5. Test results on a 7.15-mile line: 97% of longitudinal and cross level within tolerance, 3% of track only slightly deviating. By railway companies using our Plassermatic VKR-04 PX 10, all over the world these results are constantly being confirmed.
6. Always in load-gauge and ready for operation.

Result of these advantages: **MORE THAN 50 PLASSERMATIC VKR-04 PX 10 SOLD IN 1 YEAR**



Rail bending compensator by knee-lever. Only by rail bending compensator one-point-lifting and wrong liftings resulting from this method can be prevented. The knee-lever on our Plassermatic VKR-04 PX 10 is the prerequisite for the necessary counter-bending moment. For action of force see arrows.

Plasser & Theurer Railway Machinery
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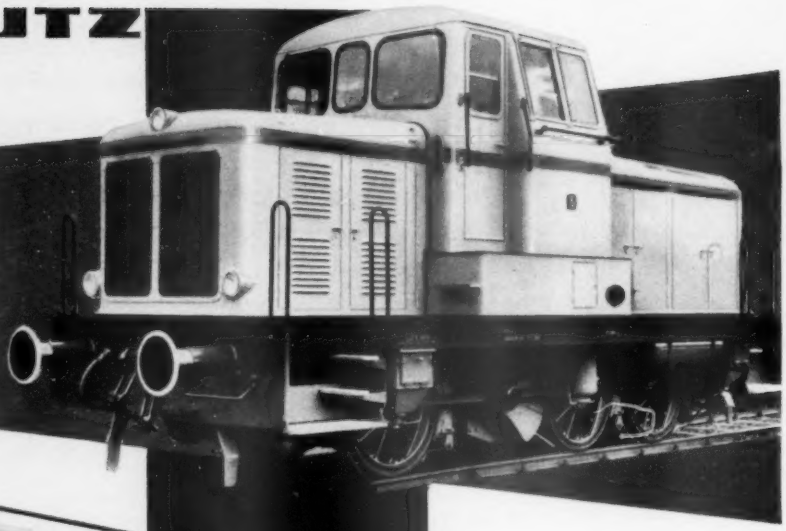
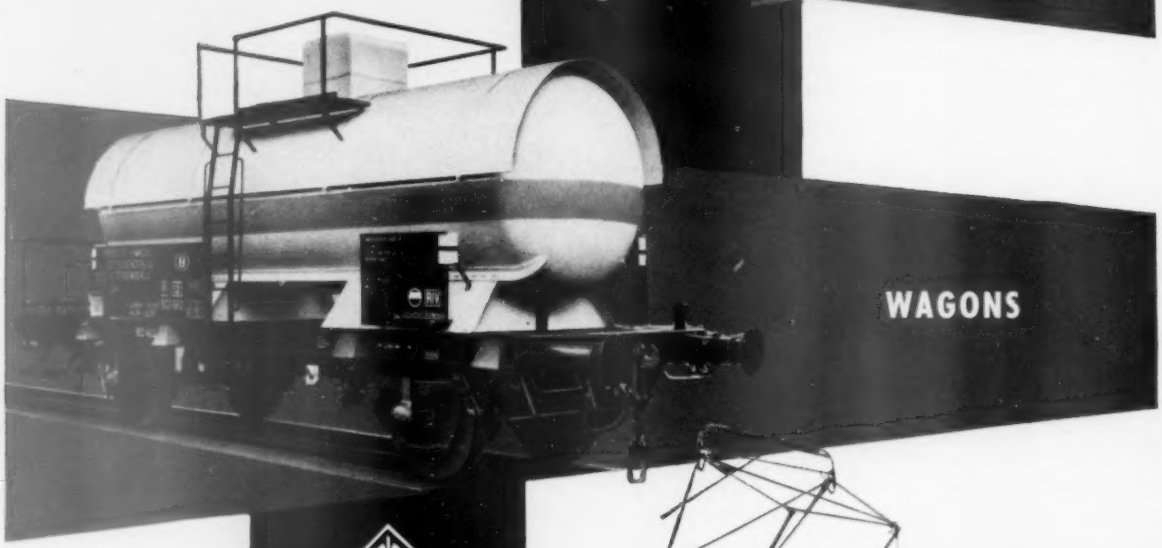
Factories: LINZ a.d. DONAU, AUSTRIA

DEUTZ

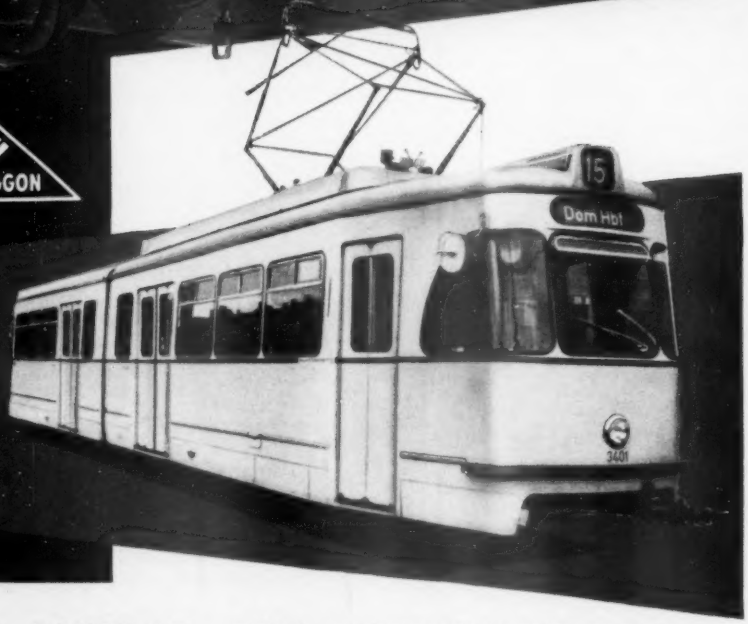


DIESEL LOCOMOTIVES



WAGONS

WESTWAGGON



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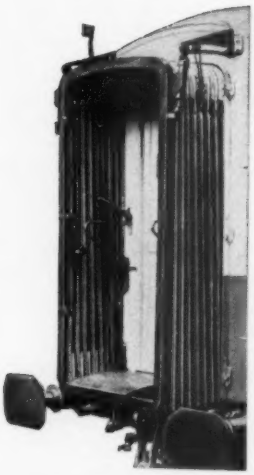

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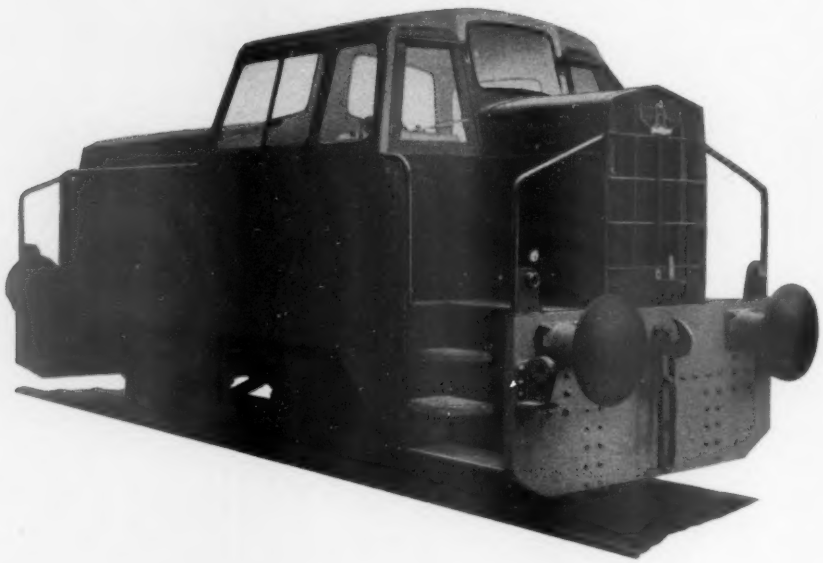
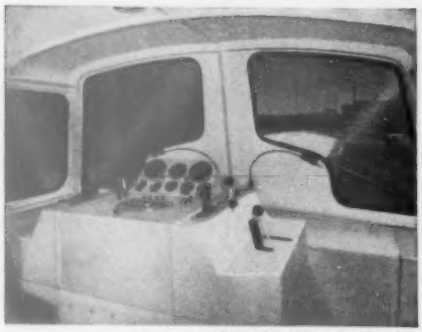


Sentinel chose

Laycock-Knorr

BRAKING EQUIPMENT



View of cab interior showing dual driver controls.

The new Sentinel 34 ton O-4-O Diesel Hydraulic Industrial Locomotives now going into service are all fitted with Laycock-Knorr compressed air brake equipment and pneumatic sanding gear.

This equipment, together with various other types of railway vehicle braking apparatus used extensively on the continent and developed by Knorr-Bremse of Munich over the last half century, is now manufactured and offered by

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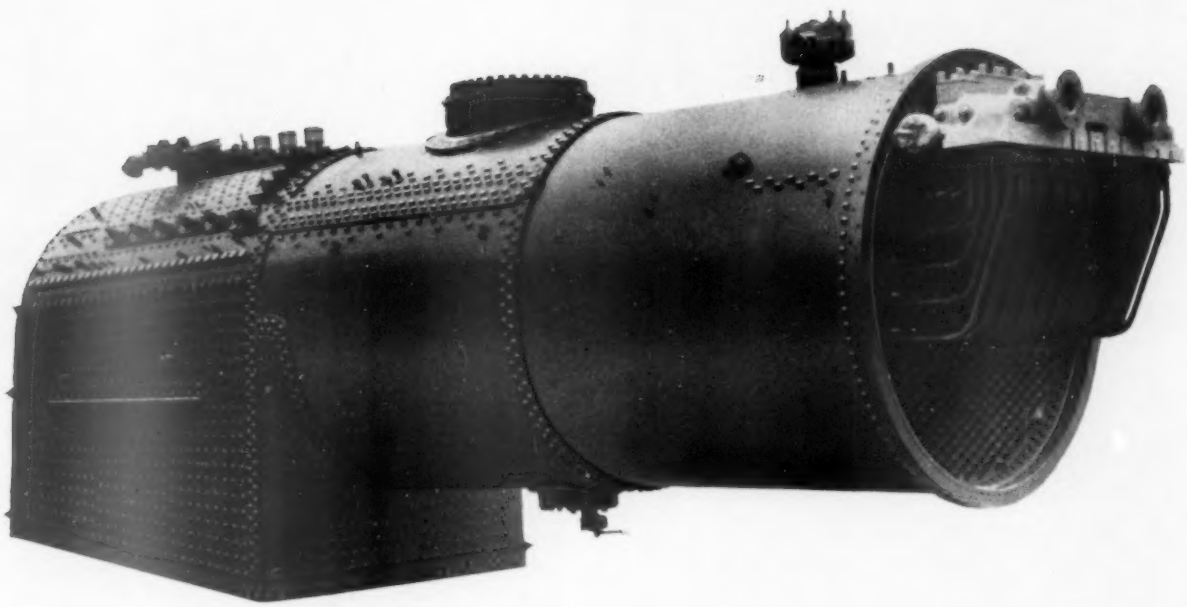
Locomotive BOILERS



STEAM locomotives will continue to handle a large proportion of traffic on the world's railways for many years.

The BOILER is the most important single component of the steam locomotive. Re-boilering is an accepted method of prolonging the life of the locomotive. In addition heavy repairs are kept on schedule by the use of spare boilers.

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Railways can still obtain boilers and boiler plates to maintain their steam traction.

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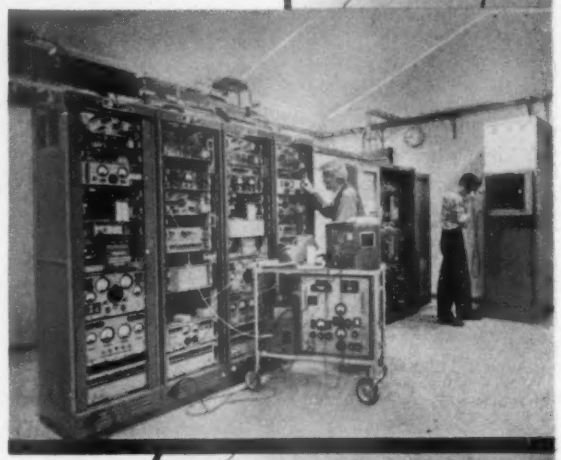

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SPECIAL FEATURES

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* Rolls-Royce Limited manufacture three-stage hydrokinetic torque converters under licence from Twin Disc Clutch Company, U.S.A.

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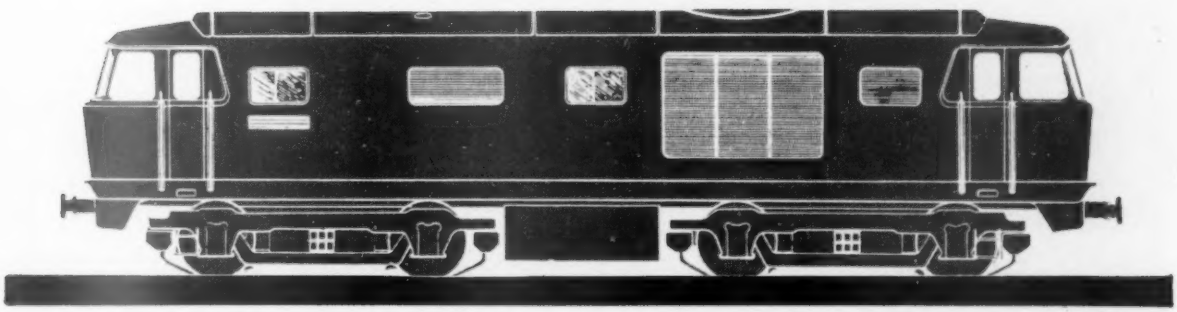
RAIL POWER BY BRISTOL SIDDELEY

New order for 50 Bristol Siddeley Maybach diesel engines brings British Railways total to 286



This latest order for 50 Maybach* diesel traction engines, for use in the new Beyer Peacock (Hymek) Ltd Type 3 locomotives, now brings the total orders placed with Bristol Siddeley for British Railways Western Region to 286. These large orders are a striking confirmation of British Railways complete confidence in Maybach high-speed diesel engines.

Maybach Diesels Already In Operation
There are already a large number of Maybach engines in service. Two Maybach Type MD 650 high-speed diesel engines, which develop a total of 2,200 hp, power the D 800 class of locomotive built at the British Railways Swindon works. The famous "Bristolian" express, for example, is hauled by one of these locomotives.

Bristol Siddeley After-Sales Service
Maybach diesel engines have built for themselves, all over the world, an unsurpassed reputation as the most efficient and reliable diesel engine of today. This engine, backed by the fast and efficient Bristol Siddeley after-sales and spares service, offers the most satisfactory solution to all rail traction requirements.

For further information, please write to: Maybach Sales Manager, Power Division, Bristol Siddeley Engines Limited, PO Box 17, Coventry, England.

**Manufactured in the U.K. under licence from Maybach-Motorenbau GmbH.*

BRISTOL SIDDELEY ENGINES LIMITED

Illustration shows treatment of Sproughton Sidings, Ipswich. *Photo, by courtesy of Chief Civil Engineer, Eastern Region, British Railways.*

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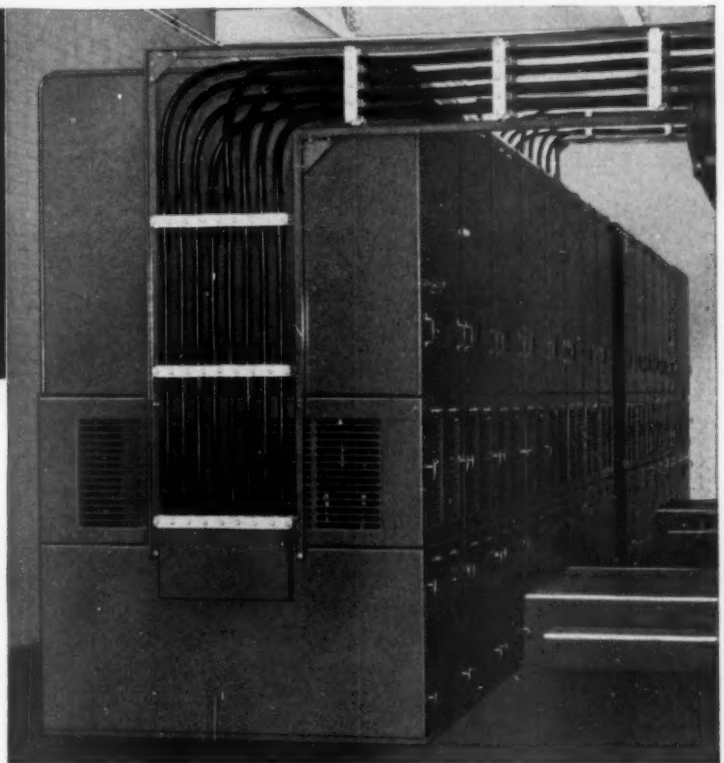
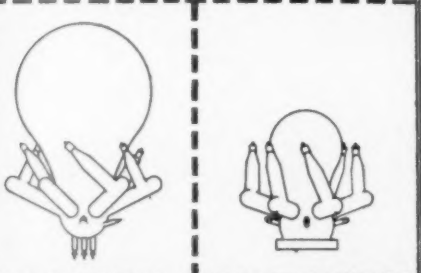
HEWITTIC Cooled-Cathode RECTIFIERS



Increased output -less space

The Hewittic cooled-cathode rectifier is essentially compact and provides a very high capacity within a given floor area.

Right: Two Hewittic cooled-cathode rectifiers forming a 5000 kW bank in the Dover Substation British Railways, Southern Region:



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- **Improved efficiency at lower voltages.**
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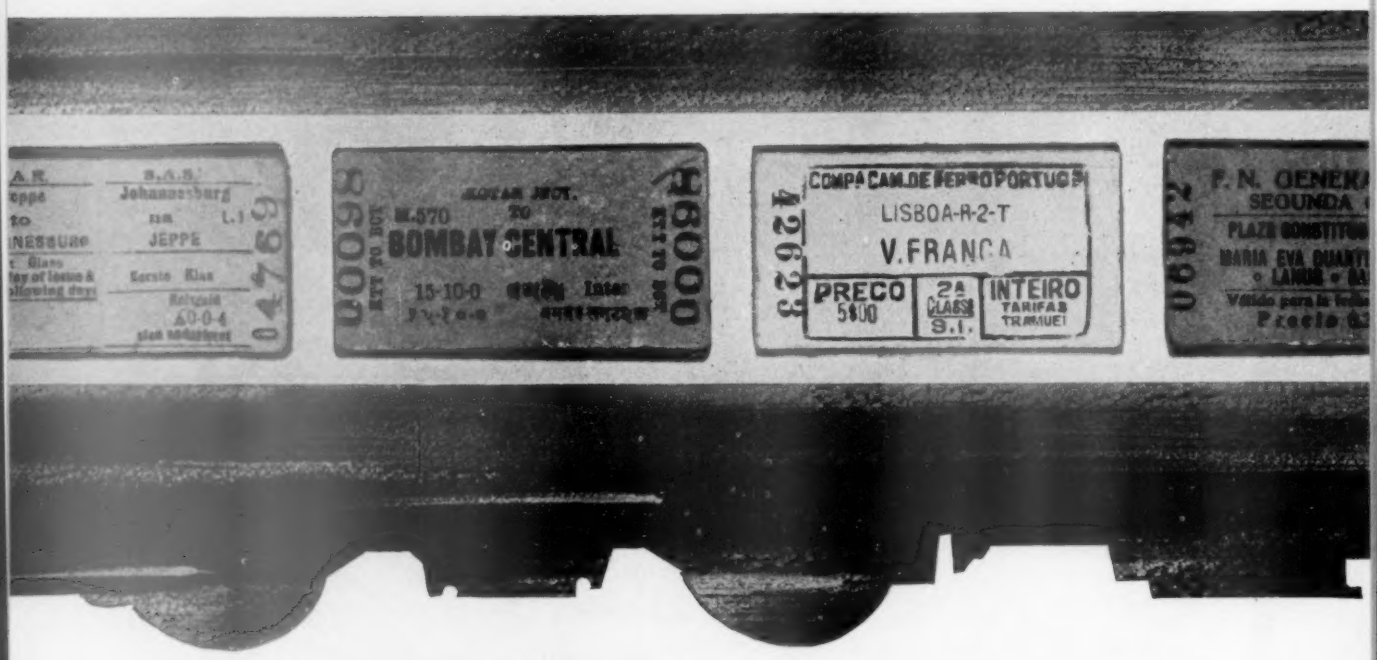

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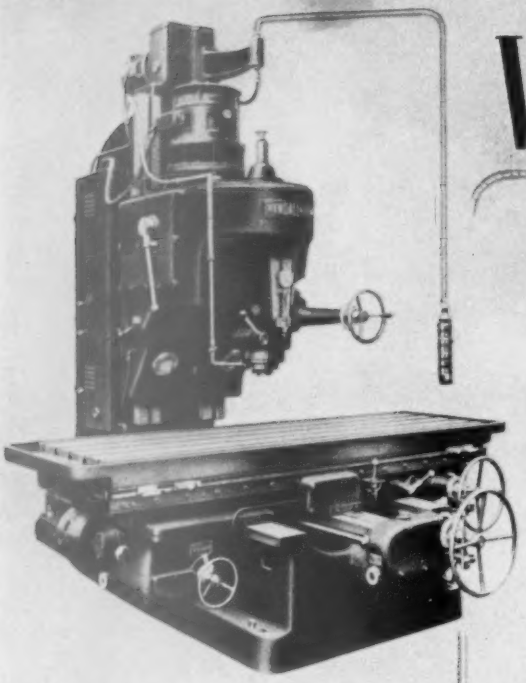
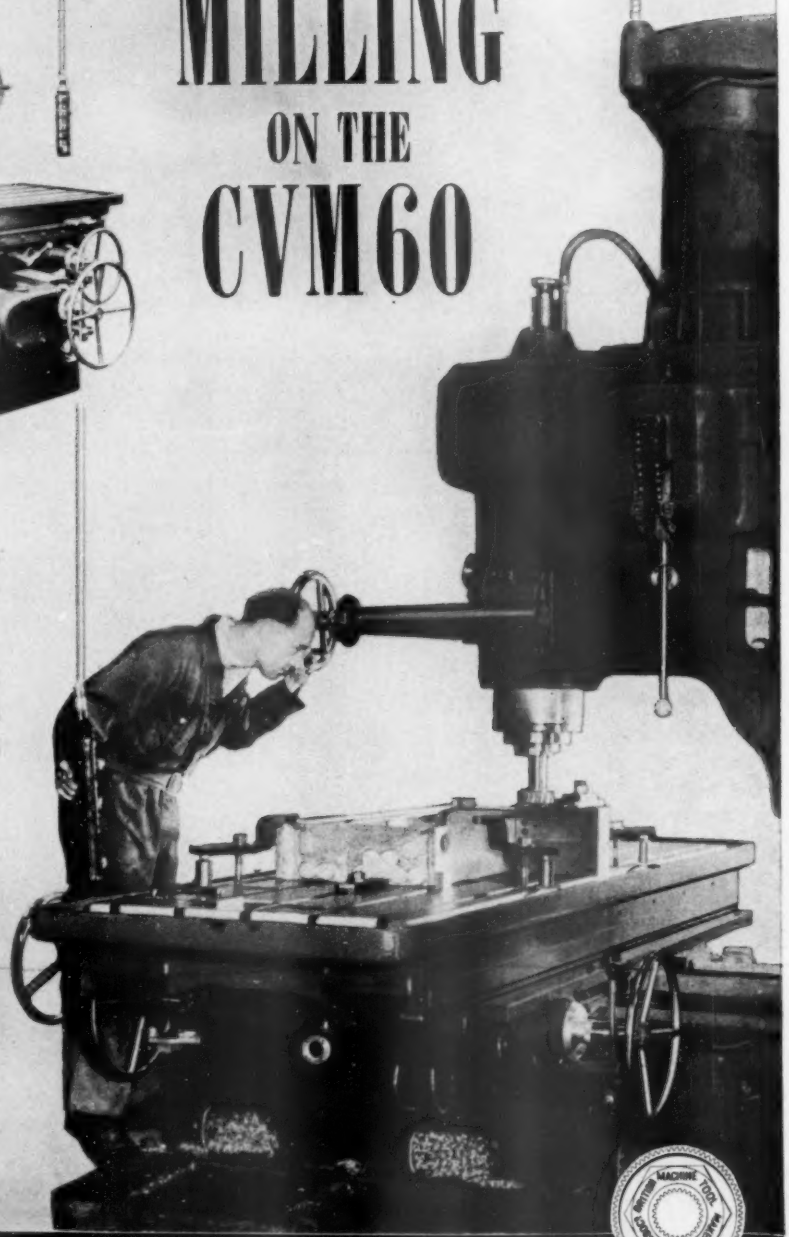
VERTICAL MILLING ON THE CVM60





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Powered by a 25 h.p. or 40 h.p. motor as required, spindle speeds range from 15 to 840 r.p.m. in eighteen steps.

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TYPE FD.1 This is a simple Brake Control Valve suitable for direct braking or shunting brake requirements. It is very simple to use and accurate in operation. The type FD.1 Valve can also be adapted for the control of the Diesel engines and can also be made suitable for cam operation. Leaflet A.13.

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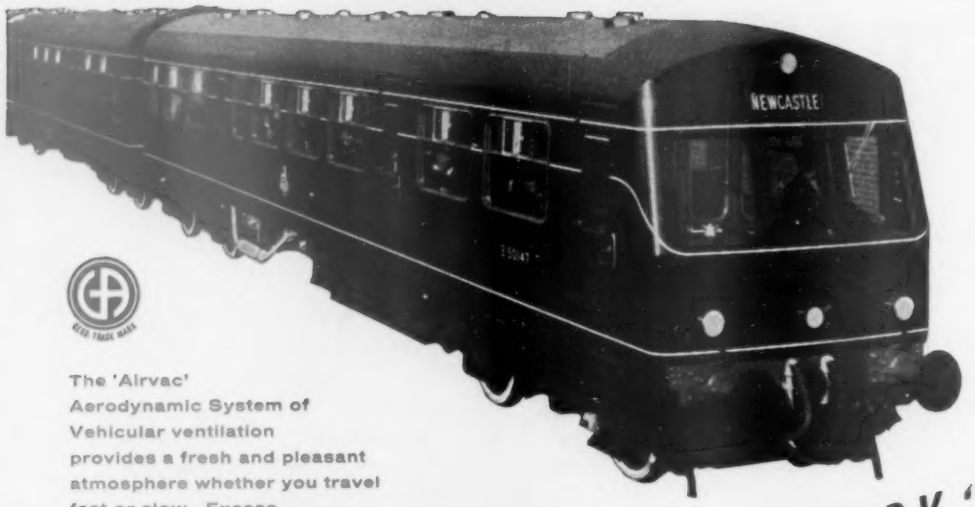

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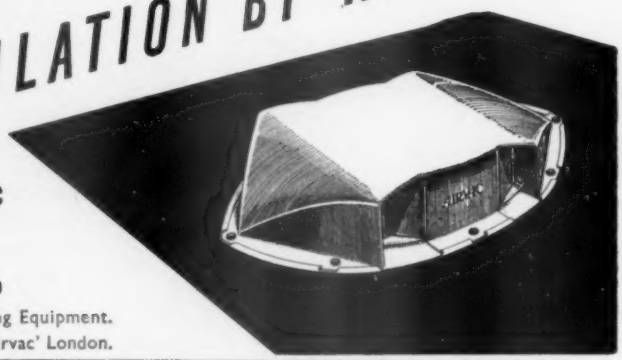

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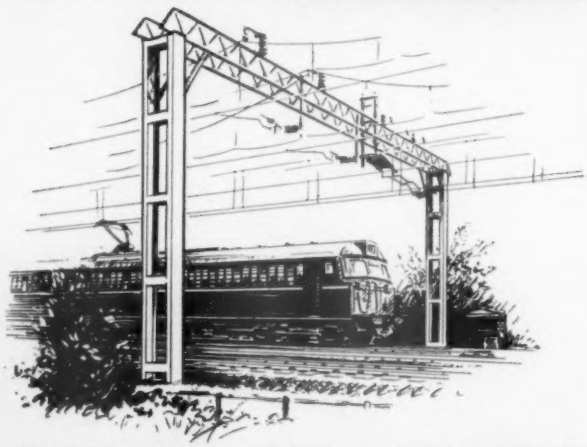

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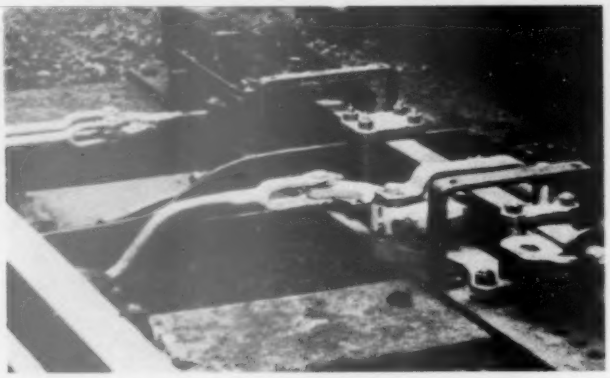

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The testing ground was a busy junction at Euston Station. DU dry bushes, running unlubricated against anodised aluminium pins, were used in the assemblies of point mechanisms that operated 300 times a day. After several months, including spells of very severe weather, inspection showed no measurable signs of wear. Operating life was estimated at twenty times that of conventional bushes and pins.

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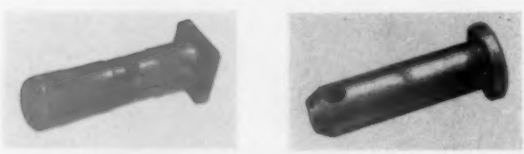
**Glacier DU dry bearings are composed of steel strip to which is sintered a layer of porous bronze impregnated with a mixture of a fluoro-carbon plastic (P.T.F.E.) and lead.*

Glacier DU dry bearings and bushes have also been tested and proven in these varied applications:- for detector boxes, train stops, upper quadrant assemblies, brake mechanism assemblies, bolster swing link assemblies and locomotive LT tap changer mechanisms, thrust screw adjustment assemblies and motor bogie axle boxes.



Left: Standard lubricated assembly with ½" dia. mild steel pin and hardened steel bushes, after three months operation.
Right: Anodised aluminium alloy pin ½" dia. from Glacier dry bearing assembly after three months operation. Dark area on pin is P.T.F.E. lead substance and indicates satisfactory operation.

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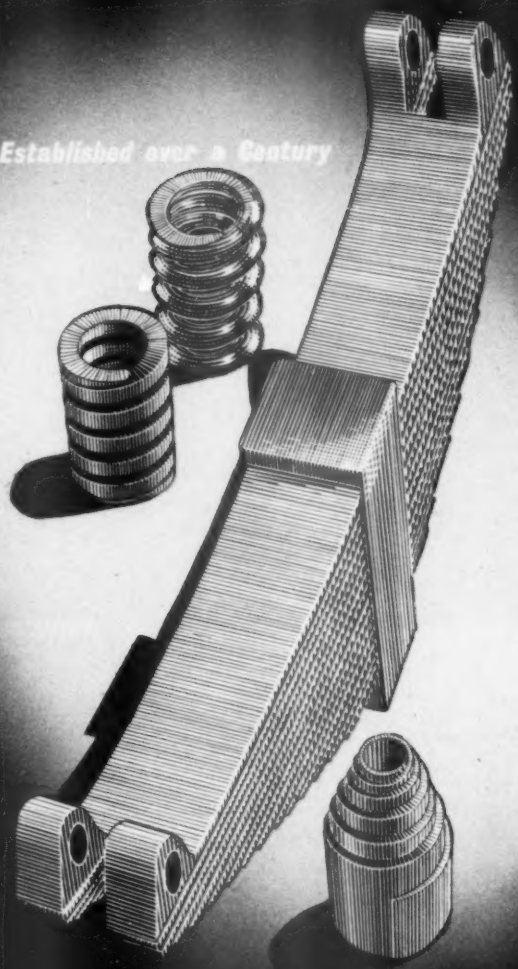

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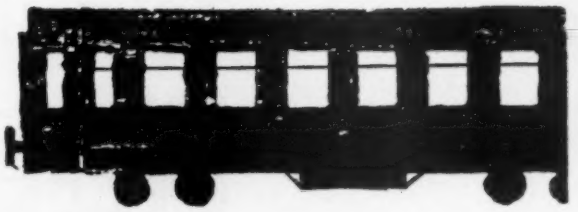

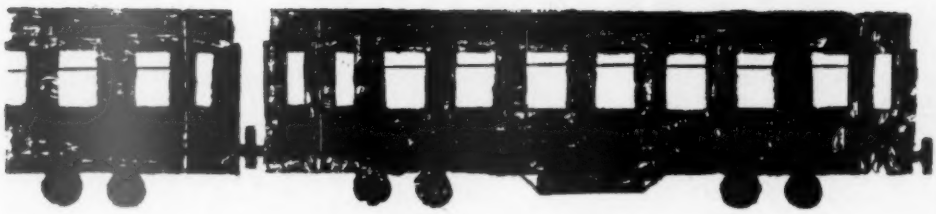

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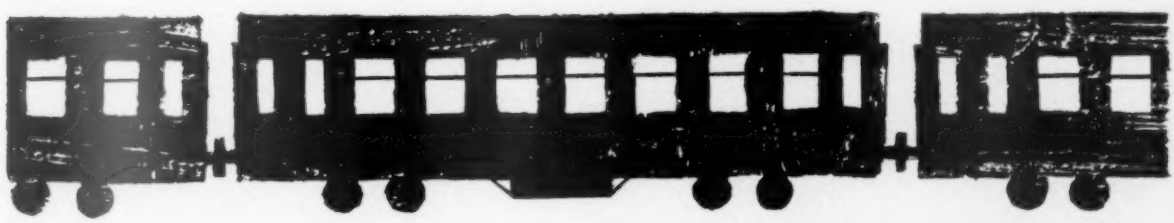

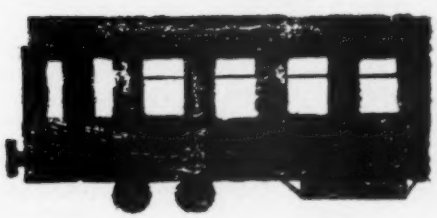

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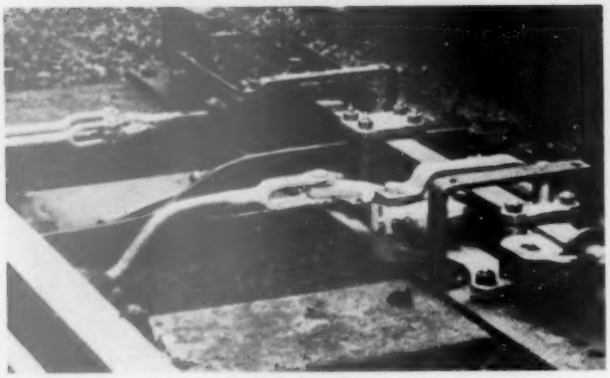

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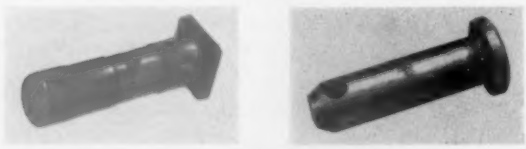

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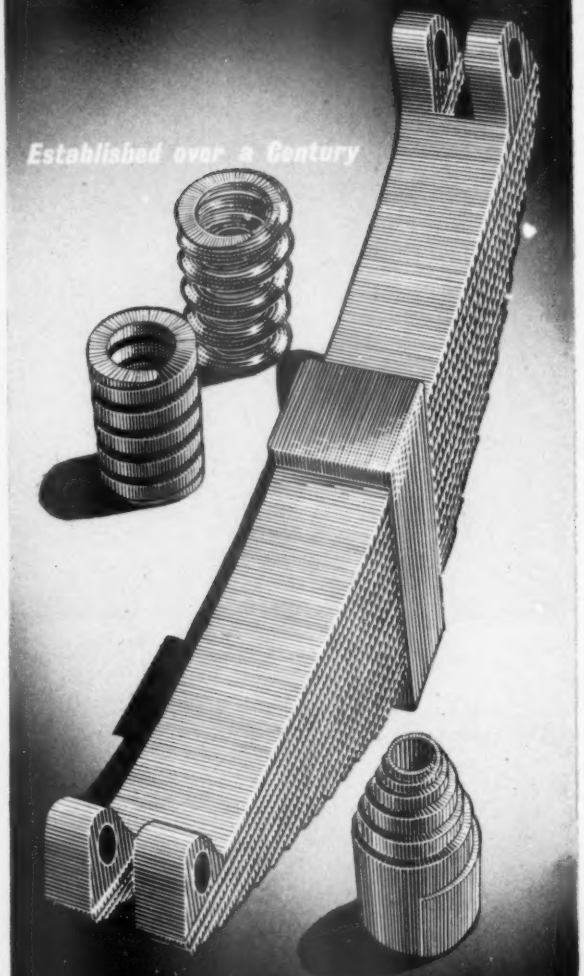

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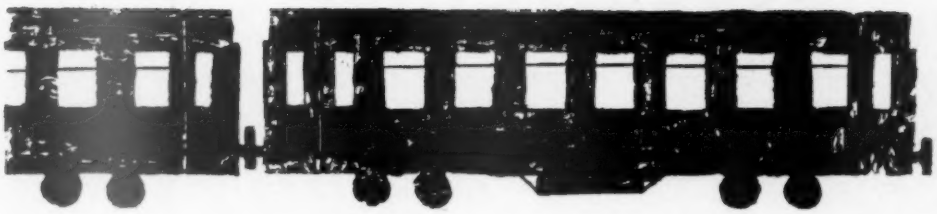

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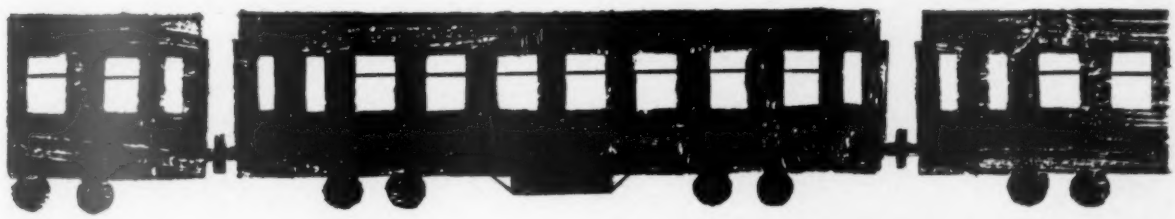

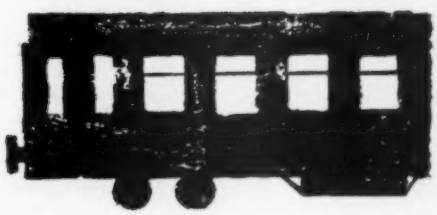

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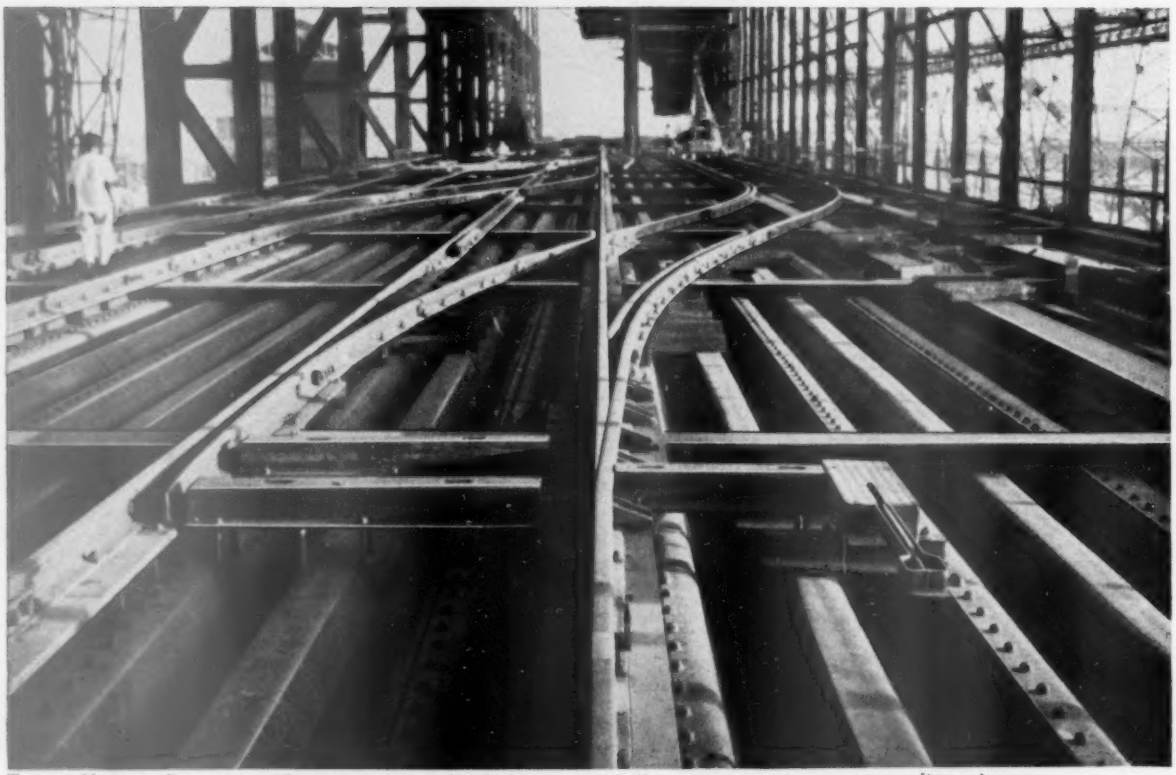

Turnout No. 15 at Durgapur, ready for concreting. In all there were 26 built-up turnouts, 4 cast manganese diamonds and 6 sets of manganese charger crossings, in a total of 2,255 feet of rail.

The high cost of modern steel production makes it necessary to work continuously at full capacity with no interruption to the flow. To meet this requirement the permanent way plays a vital role in the smooth running of the plant, and must be of the highest quality, requiring minimum maintenance. Edgar Allen & Co. Limited, were entrusted with the manufacture of the heavy duty crossings and the entire trackwork for the furnace and stock bay platforms and their approaches, much of it in Imperial manganese steel, for Dorman Long & Co. Ltd., Steel Company of Wales, John Summers & Sons Ltd. and Corvilles Ltd. and other steel plants. At the new Durgapur steelworks in India they have supplied the trackwork for the melting shop and marshalling bays which are illustrated above.

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A journal of Management, Engineering and Operation

VOL 114 FRIDAY APRIL 7 1961 No. 14

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Investment in Railways

IN RECENT issues of *The Times* some notice has been given to the investment policy adopted in a number of nationalised industries. That which has occurred in recent years in the field of railways among others has been criticised editorially, if only briefly. With so much that the leader writer could find wrong, he could probably afford little space to the railways, but he instances as examples " of backing the wrong horse " the choice of the vacuum brake and before that the development of new steam locomotives to be superseded quickly by diesel or electric traction. Following up this editorial reference, a letter was published on April 3 in the same newspaper from Mr. R. Kelf-Cohen, who referred to the report on the railways from the Select Committee on the Nationalised Industries to illustrate his argument that the root difficulty of the problem of investment by nationalised industries is the absence of any yardstick by which to test their worthwhile character—by commercial or other standards. Mr. Kelf-Cohen suggests that what is required is some body which would have the power and competence to ask questions on plans that are put forward and produce a report. In his view, the Chancellor of the Exchequer should appoint an advisory committee on investments and he proposes that this should be an engineer, an accountant, and an industrialist. Each would be paid £20,000 a year and they would be required to report on every investment plan submitted by a nationalised industry. The project will hardly commend itself to those who believe that those engaged in an industry should know best its requirements and should be at least as well able as an *ad hoc* committee to pronounce on the value of a projected investment. Our own view is quite firm that what is needed is not more, but fewer, committees—certainly so far as the railway industry is concerned. Already the time taken between the initiation of a project and proceeding to tender is so long that the cost basis may have moved upwards very substantially before work is begun. That has happened only too often in matters appertaining to the railway modernisation plan. Every care has always been taken to submit estimated costs of projects to the Ministry of Transport, which has had ample opportunity, if it lacks the necessary knowledge within its own large organisation, for testing with any independent source that it may care to select.

British Iron & Steel Federation

MR. C. R. WHEELER, President of the British Iron & Steel Federation, speaking at the annual general meeting of the Federation, referred to the industry's prospects. For 1961 an optimistic attitude was maintained and the view taken that crude-steel output might reach a total of 24½ million ingot-tons. The industry drew strength from expectations that activity in the investment field would remain high, that consumers would maintain their stocks of steel in face of current cost trends, and that the Government would ease credit restraint sooner rather than later in the year. It hoped that exports would continue at an even higher level than last year. Looking forward, the industry believed that demand will grow by 1965 to about 30 million tons (as compared with 24½ million tons in 1960). Companies' plans already envisaged a steel capacity of 34 million tons. The steel industry welcomed the progress made with E.F.T.A. but wider unity in Europe remained vital, for the good of its customers, rather than for any direct advantage to the steel industry.

B.E.A. service to Scotland

THAT the British European Airways' service between London and Scotland, which started on April 1, constitutes a serious threat to British Railways passenger receipts cannot be denied. The aircraft used are 120-seater Vickers Vanguards and the fares charged are 25s. cheaper than first-class by rail, and only 11s. dearer than second-class. The aircraft cover the distance in 1½ hr., or, making allowance for the time spent getting to and from airports, about 3½ hr. " The Caledonian " takes 7½ hr. Imponderables such as the inherent conservatism of the travelling public, the dislike of many for air travel, and the uncertainty of the weather which may preclude flying, could weigh on the side of British Railways. There is little doubt

that the policy of the railway companies before the war, in participating in air travel, was right and should have been continued. The Minister of Transport should bear this in mind in introducing legislation for the new railway constitution and take example from the negotiations, last year, between the British Transport Commission and Silver City Airways concerning the Channel Islands car ferry service.

City & Guilds progress

THE annual report for 1959-60 issued by the City & Guilds of London Institute, which shows a continued growth of activities, is the first to cover a full year's operation from the Institute's new headquarters at Portland Place. The past 12 months have seen that work augmented by other activities designed to help industry: discussions on national plans to improve technical education; organisation of apprentice competitions at the Building Exhibition and of the British entry at the International Apprentices Competition; a two-day conference on Scottish technical education, and preparing for Commonwealth Technical Training Week. This is scheduled to take place in the United Kingdom during May 29-June 4 of the current year. Nearly all Commonwealth countries and the larger colonial territories have agreed to take part. All this extra effort has involved additional expenditure—examinations, development, and general administrative work accounted for £382,274 during the year. Candidates for the Institute's examinations increased to a record figure of 143,661, of which 17,506 were from overseas.

Graduate training

SOME indication of the time, effort, and money now being put by industry into graduate training is given by an illustrated brochure just issued by Associated Electrical Industries Limited. Entitled "Graduate Training," the booklet contains many excellent half-tone illustrations and describes the scope of training available at Rugby. Led gently into industry by way of talks, films, and discussions, the young graduate receives a two-year training, retaining his freedom of ultimate choice of occupation until the end of the first year. Leisure pursuits for those away from home have not been overlooked : reference is made to some of the activities available in Rugby and the surrounding districts. It is certain that the country needs skilled and qualified engineers : it is to be hoped that these energetic measures to catch them young will call forth equal energy from the graduates themselves.

C.I.E. freight accounting

COMMENCING this month Coras Iompair Eireann has introduced a revised system of freight accounting and documentation. The former multiple-entry goods invoices are now replaced by five-part single-entry goods progress notes, made with the aid of carbon sheets. These documents are (1) forwarding-station office invoice, (2) customer's account, (3) receiving-station office invoice, (4) delivery sheet, (5) customer's delivery note. Thus one entry at the forwarding station replaces the transcriptions to books and documents previously needed at both forwarding and receiving stations. The first and second copies are retained at the forwarding station and perform the functions of the previous station invoice, progressive number book and customer's account. The remaining copies are sent to the receiving station and replace entries previously necessary in the progressive number book, delivery note, delivery book, and delivery sheet. Three-part sets are prepared at receiving stations for unentered and foreign received traffic. The former method of accounting is continuing in use for livestock traffic, it is also retained for traffic by passenger train, except that in the latter case, receipts, remittances and statistical information will be included in the weekly statement. Training centres have been arranged, throughout the country, at which the new system is being explained.

Informative announcements

TRADITIONALLY the British public is long-suffering and will tolerate much inconvenience without protesting. The yield point may be greatly extended if explanations are forthcoming. This is particularly true in connection with railway working, as experiences of London Transport have amply proved. It is not sufficient that apologies for a delay be forthcoming; they should be accompanied by a reasonable explanation, even if a very brief one. This thought is prompted by recent practice at Marylebone, where late arrivals now seem to be always explained as due to "operating difficulties." This would appear to cover practically everything which can happen on a railway and, as far as the travelling public is concerned, is particularly unenlightening. There will be occasions when the use of such phrases is unavoidable but their employment should be restricted to circumstances which render them unavoidable.

Museum of British Transport

THE first section of the British Transport Commission's museum at Triangle Place, Clapham, in South London, was opened to the public on Wednesday, March 29. It is the first exhibition in Great Britain devoted entirely to the history of public transport by rail, road and water, apart from the Railway Museum at York, smaller in size and more limited in scope, for which Mr. J. H. Scholes, the B.T.C. Curator of Historical Relics, also is responsible. The exhibits at Clapham comprise pictures, maps, documents, tickets, crests and models embracing more than two centuries. Larger exhibits, including locomotives, rolling stock, buses and trams, are housed in another part of the building, which will be opened at a later date. The choice of premises outside the central area of London has been criticised, but the museum is easily accessible by tube and bus. Moreover, the buildings (of post-war construction as a bus garage, on the site of a tram depot) have been well adapted for their new role.

Rail clips and base-plates

THE amount of thought and experiment which has been lavished on rail fastenings is commensurate with the important functions which these fittings perform. Conditions under which these fastenings operate have tended to become much more severe of recent years and research carried out into flange forces has shown these to be of considerable magnitude, sometimes surprisingly so. Having regard to the onerous work to be performed it is a great tribute to designers and manufacturers of track equipment that it is so dependable in service and equal to any demands which may be made upon it. This is in contradistinction to earlier days when the progress of motive power was for long limited by weakness of available track. Elsewhere in this issue are described base plates and rail clips which are widely used on main lines carrying heavy traffic. These complementary components are reported to have performed well in service and additionally have the merit of being simply applied.

Testing lubricating oils

THE maintenance of crankcase lubricating oil in good condition is a fundamental requirement of the successful operation of internal-combustion engines. The importance of controlling the quality of the lubricant has received much attention and already this year two important papers have been devoted to the subject. These, presented to the Institution of Locomotive Engineers, were reported in our issue of January 20. The

available information will be augmented by the symposium, organised by the Institute of Petroleum and to be held at Brighton, May 17-19, on engine testings of crankcase lubricating oil. Contributions to the symposium are divided into six sections. From a study of the paper-titles—as far as they have been announced—it is apparent that none of the papers is concerned specifically with diesel-locomotives. None the less there must be an appreciable amount of information presented which will be of value. As an example, the paper to be given by Mr. H. Haith on "Engine Test Methods for the Evaluation of Lubricating Oils Applicable to Diesel Engines Manufactured by the English Electric Co. Ltd." cannot fail to be of interest to the many railway officers responsible for the maintenance and working of locomotives so powered.

Central Transport Consultative Committee

THE report of the Central Transport Consultative Committee for the year ended December 31, 1960, dealt with railway public relations, unpunctuality of trains, public address units, provision of non-smoking accommodation, and timetables; these matters were "hardy annuals." In additional, comment was made on rough riding of trains, railbuses, changes in the former Great Central Line, and advance booking of sleeping berths.

The report showed that closing of branch lines by British Railways had reached a total of 3,000 route-miles and effected an estimated saving of £3,281,797 from 1950 to 1959, the period during which the committee had functioned. The figure quoted for last year was £305,851. The total saving since 1948 was £4,500,000. The committee pointed out that, because some proposals for branch-line closures had not been sufficiently well presented, they, and sometimes the objectors, had not always appreciated the issues involved. Delays had occurred in reaching decisions, and misunderstandings by the public had been occasioned. The Eastern Region procedure was cited as a model for other Regional managements. There remained many miles of route and many stations scheduled for examination with a view to closure, some of which, especially in the Midlands, could be kept open only with difficulty due to staff shortages. The recent pay increases had not solved the problem.

The way in which public complaints had been handled during the year came in for some criticism and the importance of dealing with each individual tactfully and sincerely was emphasised. With regard to cleanliness of stations and trains the committee pointed out the lack of adequate facilities, such as litter baskets, in the proper places and welcomed the provision of receptacles for litter on new rolling-stock. A considerable improvement in the condition of waiting rooms in London main-line stations was reported but there was room for improvement in the condition of many lavatories and waiting rooms.

A major reorganisation of the former Great Central Line had caused some public disquiet early in the year. The London Midland Region had proposed to withdraw the main-line passenger service and concentrate on the line parcels and heavy freight trains between London and the North. The scheme was thought reasonable enough and the Region had not expected a great deal of public opposition. Circumstances had provoked a great deal of public feeling but the committee had considered that, while there was a great deal to be said for the retention of the passenger service, the case which the Region had presented showed overwhelming justification for agreeing to the proposal. The miscalculation of public feeling was deprecated and the committee felt that had the pamphlet entitled "The changing role of the Great Central Line" appeared sooner, users of the line would have been better disposed toward the change. The committee also paid tribute to the British Transport Commission's efforts to complete the vast schemes which were in hand and hoped to have an opportunity to comment, during its next period of office, on the White Paper on the reorganisation of the nationalised transport undertakings.

North Eastern Region summer services

THE most notable development in the summer timetable of the North Eastern Region, operative from June 12, is the radical acceleration of the Down "Aberdonian." Leaving Kings Cross at 7.30 p.m., as hitherto, this express will now reach York at 11.1 p.m. (28 min. earlier), Darlington at 11.55 p.m. (36 min. earlier), Newcastle at 12.44 a.m. (39 min. earlier), Edinburgh at 3 a.m. (54 min. earlier) and Aberdeen at 6.27 a.m. (52 min. earlier). The southbound "Aberdonian" (8.20 p.m. from Aberdeen) will be in Kings Cross 17 min. earlier, at 7.30 a.m., and the "Night Scotsman" will leave Edinburgh 15 min. later, at 11.5 p.m., and arrive in London 4 min. earlier, at 6.43 a.m., an acceleration of 19 min.

Another accelerated train will be the Down "Queen of Scots" Pullman (11.50 a.m. from Kings Cross) which from Northallerton will precede, instead of follow, the 12.30 p.m. (previously 12.20 p.m.) Down "Northumbrian," and reach Newcastle and Edinburgh 17 min. earlier, at 5.33 and 7.48 p.m. respectively. As the result of the postponement of the Peterborough station reconstruction, the other through trains from Kings Cross to the North Eastern Region for the most part will arrive from 8 to 10 min. earlier. The morning "Talisman" will leave London 5 min. later, at 8.10 a.m., and revert to a time of 3 hr. 51 min. for the non-stop run of 232.3 miles to Darlington; the afternoon "Talisman," at 4 p.m. from Kings Cross, will again take 4½ hr. for the non-stop run of 268.4 miles to Newcastle. In the Up direction these trains will take 3 hr. 52 min. and 4 hr. 26 min. from Darlington and Newcastle to Kings Cross, arriving at 3.25 and 10.40 p.m., 10 and 9 min. earlier respectively. Up expresses from the North Eastern Region to London in general will arrive from 9 to 11 min. earlier than now.

The new "Trans-Pennine" diesel service between Hull, Leeds, Manchester and Liverpool, and the corresponding diesel-hauled Newcastle-Liverpool trains, appear for the first time in the published timetables. They have introduced several additional mile-a-minute runs in the North Eastern Region. The 8.45 a.m. and 4.47 p.m. from Newcastle to Liverpool are both booked to cover the 69.6 miles from Darlington to Leeds in 69 min., and their time of 1 hr. 55 min. from Newcastle to Leeds is faster by 21 min. than anything previously tabled. Two of the "Trans-Pennine" trains are booked to cover the 20.5 miles from Brough to Selby in 20 min. start to stop, and there are two 31 min. bookings over the 31.0 miles from Hull to Selby. The non-stop timing of 57 min. over the 51.7 miles from Leeds to Hull (by the 1.51 p.m. "Trans-Pennine") is also 14 min. faster than any previous schedule, even diesel.

It is indicative of the high speed now demanded over the main line between Darlington and York that ten expresses daily (and more at weekends) will be booked to cover this 44.1 miles in 42 min. start-to-stop, while there is a further run in 40 min. (66.2 m.p.h.). The 7.56 a.m. from Newcastle to Kings Cross will cover the 76.3 miles from Darlington to Doncaster in 74 min.

There will be certain improvements of the N.E. Region car-sleeper facilities as compared with those of last summer. From July 20, the Tuesday and Thursday services from Boulogne to Newcastle will leave Boulogne Maritime at 7.0 p.m. instead of 3.15 p.m., but the wait at Dover will be cut from 4 hr. 40 min. to just under 2 hr., and York will be reached at 6.23 a.m. and Newcastle at 8.12 a.m., only 1 hr. later than in 1960. The West Country car-sleeper will start from Newcastle on Saturdays 27 min. later, at 9.35 p.m., but will be 51 min. later in its Sunday morning arrival at Exeter, at 7.45 a.m. The Anglo-Scottish daytime car-carrier, on its southbound run, will have its wait at Newcastle curtailed, and though unchanged in its Holloway arrival at 8.30 p.m. will leave Edinburgh 35 min. later, at 12.25 p.m. The 8.55 a.m. diesel from Alston to Haltwhistle is to run through to Newcastle, calling at Hexham and Blaydon and arriving at 10.34 a.m. It will return at 10.50 a.m., calling at the same stations and at Wylam and Haydon Bridge, reaching Alston at 12.35 p.m.

Victorian Railways in 1959-60

DESPITE a sharp rise of £1,348,666 to £39,616,378 in working expenses, additional revenue earned by the Victorian Railways for the year to June 30, 1960, enabled the greater part of the higher costs to be absorbed. This is recorded by Mr. E. H. Brownbill, Chairman of the Victorian Railway Commissioners, in his annual report, a copy of which he has sent us. Operations during the year were marred by the prolonged industrial dispute over service grants.

Revenue from all sources of £39,240,397 was £993,512 more, some £400,000 of the gain being attributable to the advance of 10 per cent in passenger fares and 7½ per cent in freight rates from March, 1960. In a full year these increases are estimated to yield £2,160,000. The balance of the 1959-60 improvement resulted from a bigger volume of goods traffic, which brought in £690,829 more at £21,479,312, and average revenue per ton-mile increased by ·05d. to 3·95d. Despite a fall of 16 per cent in truckings of grains, the total tonnage of goods traffic increased by 440,000 tons to 9,281,000 tons, with three-quarters of the rise consisting of the more highly-rated categories, secured in the face of intense competition from other transport services.

Some of the principal results of working the railways in 1958-59 and 1959-60 were:—

	1958-59	1959-60
Average route-mileage open	4,357	4,292
Train-miles	18,426,495	18,281,683
Passenger journeys	163,482,829	158,293,976
Goods and livestock, tons	9,295,015	9,687,445
	£A	£A
Passenger, parcels, etc., revenue	13,364,518	13,537,486
Goods and livestock revenue...	22,125,822	22,875,947
Total earnings	38,163,680	39,198,134
Working expenses	38,119,057	39,541,704
Net revenue	44,623	* 343,570

* Deficit.

Both country and suburban passenger traffic again declined, partly because of the reduction in services through the industrial dispute and the consequent suspension of all Sunday train services from February 14, 1960. On the country routes, diesel-electric traction was extended to the South Eastern line, and on suburban lines the additional track facilities resulted in improved services, with electrification extended from Fawkner to Upfield and from Thomastown to Lalor. The suburban lines handled 153·6 million passenger journeys, or 3·13 per cent less than the 158·6 million in the previous year, but net revenue went up £312,591. Country passenger journeys were 4·6 per cent down at 4,634,645 and revenue £173,198 lower.

Mr. Brownbill states that the intensified unregulated competition for passenger and goods traffic between capital cities and also between border areas and Melbourne continued without abatement. This competition causes serious loss of revenue to the State, since it deprives the railway system of a large volume of traffic which could be economically carried with relatively little increase in present operating costs. Despite sustained competition, however, efforts to secure new business met with appreciable success. New large contracts included the carriage of substantial additional quantities of scrap iron and steel, and also malt.

Several test consignments have been made of motor-cars from Victoria to sales destinations, and negotiations for this traffic were in course at the time of the report. The introduction in 1957, and the extension in 1959, of the incentive rate for bulk motor spirit and distillates has now led to several oil companies hiring tank wagons from the Department to enable them to increase their rail despatches of these products. Gross revenue from this traffic increased by £211,393 in the calendar year 1959 compared with the year immediately prior to introduction of the incentive scheme. Additional tank wagons have been made available. In freight traffic generally, the 727,000 tons of fertilisers carried was a record.

Good progress was made with duplication of existing bridges in connection with construction of the standard-gauge line from Albury to Melbourne. Enactment of the City of Melbourne Underground Railway Construction Act, 1960, represented a positive step towards realisation of a scheme which has exercised the thoughts of planning authorities for a number of years. The system authorised consists of four parallel tracks from the western end of Latrobe Street to the Treasury Gardens, connecting with the existing suburban system to form a city railway loop. On present indications construction of the proposed underground railway will not start until 1967, the whole project being completed by 1972. This is because of the vast amount of detailed planning involved, and the necessity to complete improvements of existing suburban lines to enable them to handle the expected increase in traffic.

Progress with the replacement of steam locomotives included the purchase during the year of nine 900-h.p. diesel-electric and 12 650-h.p. diesel-hydraulic units. A further 13 of the latter type are to be delivered under the same contract in 1960-61, and tenders for the supply of 25 additional diesel-powered locomotives in the 650-700 h.p. range were under consideration.

The American railroad position

BY A CORRESPONDENT

ON March 23 a letter from Mr. S. Barron to *The Times* said that the U.S.A. railways were nearly all bankrupt, and added that it was difficult " to run the Pennsylvania Railroad, or the Baltimore & Ohio, or the Chesapeake & Ohio these days." On the next day the A.A.R. statement of railway revenues and expenses for 1960 came to hand and showed the real state of affairs. Revenues were down 3 per cent and expenses only 2 per cent, so that the operating ratio rose slightly to 79·5 per cent. Of 111 individual Class 1 railroads, 20 were in deficit. The worst shortages were $16·6 million on the New Haven, operating 1,750 miles of road at a ratio of 90 per cent, and nearly $10 million on the Erie–Lachawanna operating 3,170 miles at 88 per cent.

Any U.S.A. railway of which expenses are more than 83 per cent of revenues is in jeopardy. On 9,880 miles of road the Pennsylvania carried the largest freight and passenger traffic of any U.S.A. railway, and cut expenses by nearly 4 per cent. Because of a 5 per cent drop in freight receipts and labour disputes, its operating ratio of 82·8 per cent left it with earnings (before charges) of $4·2 million, a seventh part of the 1959 amount. The Baltimore & Ohio, working 5,900 miles at a ratio of 82 per cent, earned $15 million. The C. & O. ran 5,120 miles at a ratio of 77 per cent, and its earnings of $48 million were exceeded only by the Norfolk & Western, a rival coal road which reduced expenses by 4·5 per cent, worked at a ratio of rather less than 60 per cent, and had a net railway operating income of almost $66·5 million.

For the U.S.A. railway system of 220,500 miles of road there was left out of gross revenues, after payment of operating expenses, rentals and taxes, but before interest and other charges, $584 million last year against $748 million in 1959. That was a decrease of $164 million, or 22 per cent. The rate of return on property investment dropped to 2·1 per cent, and net income, available for improvements after interest and other charges, is estimated at $445 million, compared with $578 million in 1959 and $603 million in 1958, foreshadowing some decrease in dividends.

At present there are no signs of an upturn in railway traffic this year. For nine weeks to March 4, wagon loadings numbered 4,377,770, about 858,540 less than in 1960. Wintry weather accounts for part of the decrease, but the steel industry is slow to recover from the effects of the 1959 strike, and its decline in output harms many railways in the Eastern District; subsidised road, water and air competition is rampant everywhere. A study group on transport policies set up by the Senate states in a preliminary report that the overall railway system is not in acute financial distress, but there are indications of trouble ahead in the near future.

LETTERS TO THE EDITOR

THE EDITOR IS NOT RESPONSIBLE FOR THE OPINIONS OF CORRESPONDENTS

RAILWAY SALARIES

March 24

SIR, In the article in your March 24 issue, you express the view that it is not reasonable to cavil at the salary Dr. Beeching is to receive as the Chairman of the British Railways Board, and you state that it is all to the good that at long last the Ministry has awakened to the need to pay reasonably well for jobs of this magnitude and men of this calibre.

Later in the article you refer to justified increases in railway charges that had been put aside by Ministers for purely political purposes and go on to state that for similar reasons the Commission had been forced to agree to wage increases which could not be justified economically. One may argue, on the other hand, that because of its financial position the Commission had been forced to withhold increases in pay which it considered justified having regard to rates of pay in other industries and services, with the consequent difficulty of retaining and attracting staff of the right calibre; and the Railway Pay Committee of Inquiry certainly confirmed this contention.

If the future of British Railways is to be assured, then it will be necessary to pay reasonably well for jobs of every magnitude to secure men and women of the right calibre at all levels.

Yours faithfully,

W. J. P. WEBBER

Transport Salaried Staffs' Association,
London, N.W.1

March 20

SIR, Apropos the puerile criticisms which are being made of the appointment of Dr. Richard Beeching as chairman of the British Transport Commission, in 1903, when I entered the service of the South Eastern & Chatham Railway, the then General Manager (the late Vincent W. Hill) received a salary of £4,000 (in gold) a year for managing a small system of 600 route miles. That salary was at the time the highest paid to any railway manager. Income tax (£300) at 1s. 6d. in the £, was negligible in relation to the present imposition which has been brought about over the years by incompetent politicians of whom the present junta are by far the worst, since they were elected to combat inflation but who on the contrary daily add fuel to the inflationary spiral faster than any of their predecessors.

On the basis of the simple figures I have quoted above I will leave it to your readers to calculate what comparable amount a man should be paid to manage 20,000 route miles of railway in the present inflationary conditions.

Dr. Beeching's appointment is ostensibly to make the railways pay, a pious but forlorn hope ; the rot has gone too deep for this to be accomplished, except perhaps in the case of the former Great Eastern and Southern areas.

Yours faithfully,

R. C. HENAY

3, Ealing Village, W.5

RAIL TRANSPORT TO LONDON AIRPORT

March 27

SIR, With reference to Mr. Robert W. Lewis's letter in your issue of March 10, the extension of the Underground from Hounslow West to London Airport would be physically practicable, and the layout at Hounslow West Station has been designed to facilitate the extension of the railway under the Bath Road. An extension to London Airport would be approximately 3¼ miles long, and an intermediate station could be provided. At Gloucester Road Station direct connection, by escalator or travolator, could be provided with the Air Terminal. While not giving an exclusively airport service, the airport trains could have a limited-stop run (stopping, say, at Earls Court, Hammersmith, Acton Town, Osterley and stations beyond). The journey time between Gloucester Road and London Airport would be approximately 28 minutes. Either directly or by interchange, the trains would provide connections to the whole of the Underground system.

With the extra rolling stock which would be provided for the extension and with the higher capacity of the new trains coming into service on the Piccadilly Line, accommodation west of Gloucester Road would be adequate.

There remains the question of cost, which is estimated at approximately £12 million, including providing the additional rolling stock.

As with other new underground railway construction, there is no possibility of the receipts of the extension at standard fares being sufficient to cover working expenses and to meet the finance charges on the capital required for its provision. Nor is the prospective loss on a special service such as this one which the Executive would consider it proper to spread over the passengers using the London Transport services generally. If by charging fares higher than the standard fares the receipts could be made sufficient to cover working expenses, and if the Government or other interests were willing to finance the extension and to meet the annual charges on the additional capital expenditure involved, London Transport would be ready to undertake its construction and operation.

In any question of priority between the Victoria Line and an extension of the underground railway system to London Airport (or indeed any other extension of the underground railway system), London Transport is clear that the Victoria Line should take priority because of the widespread benefits which it will bring to public travel in the London area generally.

Yours faithfully,

R. M. ROBBINS
Chief Public Relations Officer

London Transport Executive,
55, Broadway, S.W.1

March 14

SIR, I am writing in support of the letter in your issue of March 10, which suggested that the best method of providing public transport between London and its principal airport was by extending the London Transport line from Hounslow West. The supporters of monorail and high speed rail links appear to think that all travellers to and from the airport require to reach central London as quickly as possible but I would suggest that the Piccadilly line, with its connections to other London Transport services and stations in two of the principal hotel areas of London, Kensington and Bloomsbury, is of more practicable use to both workers at the airport and visitors to the capital. By the Piccadilly line it is also possible to reach all the London main line railway stations, except London Bridge, and both the main coach stations with not more than one change, a facility which is of considerable assistance to travellers to the outer suburbs and provinces and to day visitors to the airport from these areas. If the money now being spent on widening the main roads to the airport, building flyovers and pedestrian subways and the proposed motorway had been spent on the extension of the London Transport line it would, I think, have been of benefit to a greater number of all the travellers to the airport, plane passengers, workers and visitors, than any other scheme.

Yours faithfully,

J. MORLEY

124, Byron Avenue, Hounslow, Middx

PRESERVATION OF WOOD

March 27

SIR, While Kyanising is no longer practised in wood preservation ("Destructive timber preservative," The scrap heap, March 17), a word in its defence is not out of place. This treatment was used in many of the early railway viaducts and bridges including the famous laminated timber viaducts at Willington Dene and Ouseburn; both built in 1837.

Moreover, the 70 wooden viaducts built in the West Country by Brunel were all of Kyanised Oregon pine and Western yellow pine. Not a single one was destroyed by fire throughout their average life of 50 years service. As late as 1926, six survived on the Falmouth branch, of which the Collegewood Viaduct at Penryn was 71 years old when replaced in stone. The prime reason for their replacement was the scarcity of the very large slow-green timbers used in their construction. The bridges were designed for the easy replacement and repair of timbers with minimum interference with traffic, and only nine teams each of six men, plus one inspector kept all 70 bridges in good condition. Other reasons for rebuilding were: increasingly heavy trains, need for more double track bridges and, in a few cases, basic instability due to being built on a curve or even in the form of an S-bend.

Kyanised timber was well liked by the bridge men because of its resistance to burning and it was found to be no more slippery than untreated wood. Timber breakdown occurred where the legs rested on iron castings and at bolts—which might be expected with a highly reactive preservative. Its weaknesses lay in the method of application (soaking for one day per inch of widest measure); they would have been better incised and pressure treated. Mercuric chloride (or, to use its old name, corrosive sublimate) is very corrosive to iron and this may have dictated the use of soaking in the case of the Brunel viaducts. The timbers of the North Country viaducts referred to above were pressure treated, but there is evidence to suggest that the treatment plant was written off in the course of their impregnation! This preservative too was a single chemical type and there is no reason to believe that it is toxic to every one of the biological agencies which can destroy timber.

These defects have been overcome in modern preservatives such as our own "Tanalith" C, which has the same non-oily fire resistance coupled with stability and universal toxicity to wood-destroying fungal decay and insects.

Yours faithfully,

R. T. SMITHSON

Hickson's Timber Impregnation Co. (G.B.) Ltd.,
Castleford, Yorkshire

BRITISH RAILWAYS MOTIVE POWER

March 18

SIR, I refer to my letter of February 15 in reply to Mr. Casserley's communication suggesting a 12 week-day statistical record to obtain a practical comparison of costs between steam and diesel operation.

Although Mr. A. W. T. Daniel in your issue of March 17 states this question has been well covered by Mr. H. F. Brown's paper on "Economic results of diesel-electric motive power on the railways of the United States of America," may I point out that Mr. Brown in the same issue of *The Railway Gazette*, says that, though his paper is based largely on statistics, it nowhere claims any proofs obtained from statistical data, his five claims being a probability. Of course, he is speaking only for the U.S.A.

So far as British Railways motive power is concerned, may I say that, unless statistics can give practical help and make a positive contribution to lift the industry out of the "red," then they are not seriously worth considering.

I suggest that an experimental test be made on the Western Region by retaining the existing steam engines, and calling a halt on the allocation of further diesels. The administrative overhaul of the whole Region should be included, so that estimated savings can be passed on to railway users in the tangible form of lower fares and charges, for the mutual benefit of all.

The use of the steam engine in breakdowns of both electrical and diesel traction has proved that it has not outlived its usefulness.

Another factor is the safeguarding of the national economy against unlimited diesel fuel being imported into the country to the detriment of our natural resources of coal.

If the above experiment narrowed down to 12 months is adopted and proved successful by steam traction holding its own in certain directions, I believe it would be advantageous for the railway authorities to take over or lease a redundant coal-mine from the National Coal Board, and work same for the use and efficiency of railway transport,

Yours faithfully,

ROBERT W. LEWIS

104, Leggatts Way,
Watford, Herts

TRACK CAPACITY

March 18

SIR, Recently commuters on the Southern Region suburban services were handed a pamphlet entitled, "Where's My Seat?" In brief, the Southern Region claims that it has done all it can to ease the situation but that unless the passengers can persuade their employers to stagger working hours, then things will go on getting worse.

I personally do not think that everything has been done to increase track capacity and as an example quote the section from Herne Hill to Elephant & Castle which still has semaphore signalling. I wrote to the Assistant General Manager (Traffic) with a suggestion that with modern signalling on this section, Ludgate Hill Station, and Holborn Viaduct (Low Level) could be renovated, the track relaid through the tunnel of the East spur from the Low Level to Aldersgate Street (Metropolitan widened lines) and the whole electrified to Moorgate. By this means extra trains could be run into the heart of the City of London, thus reverting in a modernised manner to the pre-1914 practice.

I received a very sympathetic reply but was told that the main difficulty was that the tunnel was not sufficient to accommodate rolling stock of modern design. Not really content with this answer, I investigated the tunnel in question only to find that a considerable portion of it is in course of demolition. This is where it ran below the Smithfield Meat Market, a part of which was demolished by fire a year or two ago.

Surely now would be the time to ensure that new tunnels are constructed of adequate dimensions and a first move made towards providing the extra facilities that the London travelling public so badly needs.

Yours faithfully,

D. W. MOUNTAIN

34, Harbury Road,
Carshalton, Surrey

RAILWAYS INTO ROADS

March 15

SIR, In your issue of March 10, Mr. A. W. T. Daniel has essentially rested his case for further railway development on the railways' ability to carry passengers non-stop between particular points at a higher speed than is possible on a road. Although this may be so it is the "door-to-door" time which really matters, and one of the reasons for the rapid growth of private motoring is, no doubt, the advantage which it can confer in this respect; even over quite long distances, and where the alternative includes a relatively high-speed portion by rail.

For inter-urban travel over long distances the railway has the advantage in speed over road, but this field is becoming increasingly dominated by the airliner and, even if a four hr.

timing were introduced tomorrow between London and Edinburgh, it is doubtful whether it would do more than temporarily slacken the erosion of the railways' Anglo-Scottish passenger traffic.

Taken overall, public passenger transport services on the converted railways should be more attractive than those which can be offered by a modernised railway. The train, with its relatively high carrying capacity, is usually obliged to make several intermediate calls if it is to draw to itself sufficient traffic to produce an economic load factor, and because of these calls the throughout average speed is substantially reduced. One effect of the train's substitution by road passenger vehicles of smaller capacity would be the ability to obtain economic load factors for much longer non-stop runs, and consequently for up-to-medium distances journey times should generally compare favourably with those possible by rail. The frequency of service would also tend to be very much greater.

The present trend in railway operation is towards running locomotive-hauled trains of fairly high capacity between principal centres, and feeding these with services operated by diesel multiple-units; broken journeys are therefore tending to increase. On the converted network the smaller units of movement – mostly with a broadly similar capacity – would encourage a much more diverse pattern of services, enabling through journeys to be made where a change en route is now necessary.

Passenger services on railways are seldom financially self-sustaining and their continued provision is made possible only by subsidisation. On the other hand, public service vehicle operation on the roads is reasonably rewarding despite the small size of the vehicles and the low operating speeds. On converted railways, the very much larger road vehicles practicable and the higher average journey speeds attainable would bring about a fundamental improvement in productivity of crews and vehicle usage. Public passenger transport on converted railways should be thoroughly profitable and make no call on the national purse.

Yours faithfully,

BENBOW

Potters Bar,
Middlesex

AMERICAN DIESEL TRACTION

March 18

SIR, May we be spared further efforts of Mr. H. T. Brown to prove that the steam locomotive should not have been eliminated in the United States ? It was tried out in the last world war and failed. The diesel came to the rescue and is at present the most economical and versatile form of traction available.

In 1940, on the verge of America's entry into the war, the railroads had 40,297 steam locomotives, along with 811 electric and 657 diesel complete locomotives as operated. Of these, 9,100, or nearly 22 per cent, were unserviceable. In that year road freight helper miles numbered 34,471,000, or 6 per cent of total freight locomotive mileage. In the 1943 stress of wartime traffic, helper miles rose to 63,599,000, nearly 8 per cent of total locomotive miles. To get relief the railroads installed over the next five years to 1948 no fewer than 5,710 diesels and only 682 steam locomotives.

Freight helper locomotive miles dropped to 42 million in 1948, and then declined rapidly to less than 8 million in 1959. By that time passenger helper locomotive miles, which numbered over 30 million in 1943, were negligible in amount. Unfortunately, the streamlined diesel passenger trains, which broke all records for speed and punctuality after the war, especially in the Western District, are suffering from the competition of subsidised road and air services.

The Association of American Railroads has been discreet in stating the advantages of diesel motive power. An inquiry which it instituted in 1945 showed that a diesel unit displaced on an average about 1·4 steam switchers in shunting yards. On main line movement the advantages of the diesel were its ability to work long hours, a high degree of fuel efficiency and small use of water, so that it could make longer runs than a steam locomotive and register a greater monthly mileage, its quick acceleration and its flexibility through the system of separate power units.

Mr. Brown asserts that steam trains were as heavy and moved as fast as diesel-hauled trains now do. It so happens that the Denver & Rio Grande Western, operating about 2,072 miles of road in mountainous Colorada and Utah, now depend entirely on 254 diesel units for its standard-gauge lines. In 1945 it worked 5,924,900 freight-train miles, with a net revenue train load of 980 tons at a speed of 15·4 m.p.h. In 1959, freight-train miles dropped to 3,385,050, but the train load rose to 1,565 tons moving at a speed of 20·9 m.p.h. Gross ton miles in a train hour increased from 32,620 to 69,030, or by 111 per cent. The Rio Grande's operating ratio was just over 67 per cent, compared with 78 for U.S.A. railroads as a whole, and of 90 per cent on the New Haven which is now insolvent.

An article in your March 3 issue told how six enterprising railroads were using diesel power to good advantage. In some ways the Rio Grande's progress is just as striking.

Yours faithfully,

YOUR CORRESPONDENT

Westminster, S.W.1

THE ROYAL ALBERT BRIDGE

March 11

SIR, In the article in *The Railway Gazette* of March 10, it is stated that the track is suspended from the chains, and the diagram shows (not to scale) the resulting deformation under unbalanced loading. I am puzzled by this, as the vertical members are attached to both the chains and the tubular arch, which, having greater rigidity, would resist this deflection.

I had always understood that whereas the Chepstow bridge is a suspension bridge, with a horizontal tube to balance the tension in the chains, Saltash is an arched bridge, with chains to take the thrust.

I have, therefore, turned up the life of Brunel by his son. On page 219 it says, " At 11 points in the length of the truss the chains are connected to the tube by upright standards, which are braced together by diagonal bars, in order to resist the strains due to unequal loading. The roadway girders are suspended from the truss at the upright standards already mentioned, and at an intermediate point between each of them." On page 220, " The truss may be described as a combination of an arch and a suspension bridge, half the weight being placed on the one and half on the other, the outward thrust of the arch on the abutments being counter-balanced by the inward drag of the chains."

Can the author of the article explain to me how only the roadway girders and chains can deflect in the manner shown, without stressing the tube beyond its elastic limit ?

Yours faithfully,

J. R. HARDING

38, Station Road, Wylde Green,
Sutton Coldfield, Warwickshire

[The design of the so-called trusses of the 455-ft. spans at the Royal Albert Bridge is a development of the principle used at the Chepstow Bridge. At Saltash the live load is intended to be shared more or less equally between the arched tube and the suspension chains. The diagram showed how the chains ahead of a train loading half a span tend to straighten out and so cause the verticals to bend about their rigid connections with the tube. Doubtless there is some complementary distortion of the tube, but its moment of resistance is large, and the bending due to this distortion is so small that any deformation stresses set up in the tube are unlikely to strain the wrought iron beyond its elastic limit.—ED. *R.G.*]

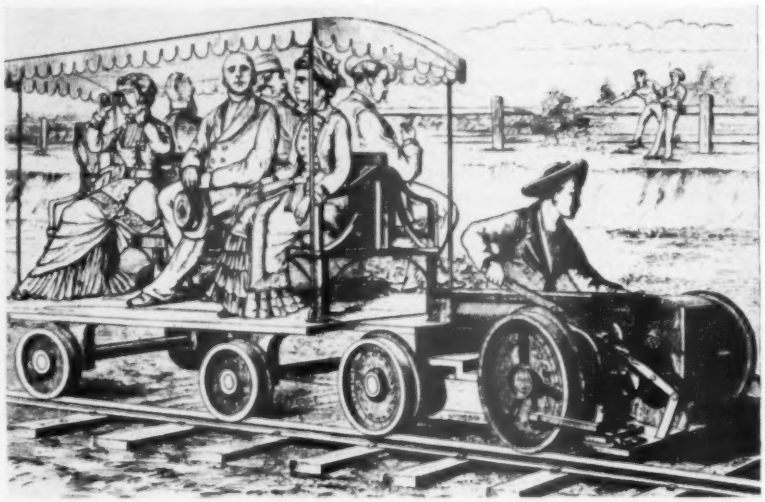
The Scrap Heap

Regular service

A poster for the Shah Jehan Mosque at Woking, in Surrey, reads: "From Woking Station, the Mosque is a quick 12 minutes walk. Exit on Platform No. 5. If you have somehow missed the last train, take the next. You may still be in time to join a part of the ceremony." — *From the "Evening Standard."*

The Edison locomotive

Eighty years ago the experimental electric locomotive built by the electrical wizard Thomas Edison was the very latest word in modern railways. This was the first electric locomotive to draw power from a trackside power station—110V. Earlier models used batteries mounted right on the locomotive. The Edison locomotive was purely experimental. It ran on a short stretch of track at Edison's Menlo Park Laboratory in New Jersey. It was not until 1892 that the first electric locomotive practical for railroad application was built. Manufactured by General Electric Company, this first commercial model was exhibited at the Chicago World Fair in 1893.



Thomas Edison's electric locomotive

Why - are - we - waiting ?

Police at Constitucion in the Argentine had to intervene on February 24 when, during the evening rush-hour, all incoming and outgoing trains on the Roca Railway were halted. When only three coaches of a six-coach train moved off two hours late, their passengers broke windows, removed fittings, tore upholstery, broke lamps, and did all other damage they could. Those left on the remaining three coaches took similar action and also set fire to the last coach, which was destroyed. A signalbox in Lanus was set alight and, in Constitucion itself, passengers ignited seats and anything else inflammable they could find. Order was finally restored by the intervention of a tear-gas squad and the cancellation of all remaining trains. We also understand that, on the same railway, two dining-cars have been destroyed by fire within a few days on the Mar del Plata-Buenos Aires route.

Speedy tunnelling

In view of the interest currently displayed in tunnelling methods and speeds it may be recalled that in 1922 a Whitaker boring machine, working in the lower chalk, near the Martello tunnel between Folkestone and Dover, was reported to be able to progress 120 ft. per day. This machine, and its precursor the Beaumont boring machine, were referred to in the paper on "The Work of the Channel Tunnel Study Group, 1958-60," discussed at the Institution of Civil Engineers on March 21.

Competition unwelcome

It was evident from the proceedings at the meeting of the Metropolitan Railway Company yesterday that the proprietors have not yet reconciled themselves to the existence—and success—of the "Twopenny Tube." Colonel Mellor, who presided, complained that "it certainly did seem a little hard on an enormously costly railway such as theirs to have to contend against the varied kinds of competition it had to meet, coupled with the heavy burden of taxation placed upon it"—*From "The Financial Times" of January* 26, 1901.

Last of the London, Tilbury & Southend locomotives

Last of the L.T. & S. locomotives

Locomotive number 41947, Class "3," 4-4-2, London, Tilbury & Southend type passenger tank, was withdrawn from service on December 3, 1960. This locomotive was one of 34 built at Derby Locomotive Works in 1927 to the design of Sir Henry Fowler, Chief Mechanical Engineer of the former London Midland & Scottish Railway for working on the L.T. & S. line. When first built the locomotive was numbered 2129 and was subsequently given British Railways number 41947 in 1949. It has run a total of 716,593 miles.

OVERSEAS RAILWAY AFFAIRS

FROM OUR CORRESPONDENTS

ISRAEL

Railway development

Ashdod, the new Israel port town on the Mediterranean coast 20 miles south of Tel Aviv, is being linked by rail with the national network. This development is in connection with the 150,000-kW. power plant under construction at the town. It is also possible that Eilat, Israel's port on the Red Sea, will have a branch railway—the Israel Government is ready to construct approach roads and a rail extension if the Israel–American Phosphates Company, a subsidiary of the Alumina Corporation of U.S.A., can find and produce a source of 600,000 tons of phosphates a year for 10 years.

RHODESIA

Visit of Director General

The illustration on this page shows from left to right : Mr. L. Q. Botelho de Sousa, Bulawayo Representative, Mozambique State Railways ; Mr. T. A. Wright, Regional Manager (Designate), Rhodesia Railways, Bulawayo ; Mrs. D. W. Drummond and Mr. Drummond, Bulawayo Representative, South African Railways ; Mr. Manuel A. Brum, Commercial Manager, Mozambique State Railways ; Mrs. Botelho de Sousa; Mr. H. A. Brazao de Freitas, Director General, Mozambique State Railways & Harbours, and Mr. J. H. Allen, General Manager, Rhodesia Railways. The photograph was taken on the occasion of the first visit to Bulawayo of Mr. Brazao de Freitas since Mr. J. H. Allen assumed office as General Manager, Rhodesia Railways, earlier this year.

ARGENTINA

New organisation mooted

A completely new organisation for E.F.E.A. recently was called for unanimously by a joint rationalisation committee formed recently by Eng. M. F. Castello, Argentine Transport Secretary (President); Eng. A. Neni, Transport Secretariat (Chairman); Eng. J. F. Alexander, Ministry of Public Works & Services; Dr. A. Seeber, Argentine State Railways; Mr. A. E. G. Bono, La Fraternidad; Mr. J. Prevassi, Union Ferroviaria, and Mr. O. J. Demo (administrative staff).

Improving Roca suburban services

To improve suburban services into Constitución, the Roca Railway has borrowed locomotives and carriages from other Argentinian railways. The Mitre and Sarmiento Railways have lent four diesel-electric locomotives each and, in addition, the Mitre has lent 20 coaches. New Fiat motor-coaches are in service on the Monte Grande line and a locally-reconditioned locomotive which was on show at the 150th Anniversary Exhibition has been returned and put in service.

Motors for underground stock

The first consignment of Argentine-built motors for underground railway coaches has been handed over by Construcciones Electromecánicas Especiales S.A.I.C. (C.E.E.).

URUGUAY

Railway improvement

Part of an extensive national improvement scheme under consideration in Uruguay is the extension of the railway line to the north of the country. The extension would include the construction of a bridge and a viaduct across the Rio Negro. The whole is estimated at a cost of U.S.$10 million. During the next five years, it is planned to spend 240 million pesos on Uruguayan railway extension, 200 million pesos on Montevideo Harbour, and 200 million pesos on the construction of a port on the Rio Uruguay.

NEW SOUTH WALES

Stainless steel multiple-unit stock

The New South Wales Government Railways administration recently introduced stainless-steel trains on the Sydney-Gosford service. It is stated that this innovation has revolutionised travel from and to the Central Coastal area of New South Wales, with considerable increase in the numbers of commuters to and from Sydney. The trains comprise up to eight coaches and are electric multiple-unit sets. In the Hawkesbury River area they have to negotiate ruling gradients of 1 in 40.

QUEENSLAND

Mt. Isa line rehabilitation

The first three, 1,650-h.p. Co-Co diesel-electric locomotives built by the English Electric Company against an order for five have now been delivered. In addition the contract for a further five of these units has been let to that firm. Deliveries have also begun of the 200 20-ton four-wheel hopper wagons ordered from the Commonwealth Engineering (Queensland) concern. Relaying of the 242-mile section between Richmond and

Arrival of Mr. M. A. Brazao de Freitas at Bulawayo

Duchess with 82-lb. in place of 42-lb. section rails, is also in hand.

Ninth air-conditioned express train

A vote of £97,370 has now enabled the Queensland Government Railways to complete the ninth air-conditioned train, seven of the 10 carriages of which are already completed in the railways' Ipswich shops.

WESTERN AUSTRALIA

Standardisation in Western Australia

Two major projects to standardise railway gauges in Western Australia are under discussion by the Australian Federal and State Governments. The Government is considering a request for help in standardising the line from Broken Hill in New South Wales to Port Pirie in South Australia to help the export of minerals. The projects form part of plans for developing the Australian export trade in steel, coal, and other minerals. Surveys have indicated that outback road development could lead to an expansion of private investment in the beef industry and increased export earnings of £A15 millions to £A20 millions a year.

NEW ZEALAND

Ministerial views on railways

The New Zealand Minister of Railways has stated that he believes a lot of money can be earned by the Railways Department in letting land it does not require. The Minister has offered to make railway land in Hastings available to the Borough Council of that town. In New Zealand, he said, people expect land not required by the railways to be made available at a nominal rental.

Improved passenger traffic

Passenger traffic on the New Zealand Railways was heavier during the six-week period December 10, 1960, to January 21 last than during the corresponding previous period. Non-suburban railcar and express train passengers passing through Wellington and Auckland increased in each case by 6,000 to 91,000 and 72,000 respectively, while Christchurch handled 67,000 passengers (3,000 more than last year). North Island main trunk expresses carried 24,000 passengers during the six weeks quoted. These figures include part of the traffic conveyed by the " Scenic Daylight " express service which carried from 250 to 300 passengers on nearly every journey.

VICTORIA

Freight record

For the seven completed months of the current financial year, Victorian Government Railways loaded 531,283 wagons of general freight, including live-stock. This was equal to the loading of 17,709 wagons weekly. The total figure represented an increase of 44,599 vehicles over the corresponding period of the previous year.

PUBLICATIONS RECEIVED

North Eastern Express. The first issue of the journal of the recently formed North Eastern Railway Association contains items on motive power, rolling stock, and working (including signalling) of the former N.E.R. and its successor, the London & North Eastern Railway, and on present-day matters such as installation of C.T.C., forthcoming station closures in British Railways, N.E. Region, and the Railway Museum at York. There is a bibliography and a list of queries. The Association was formed to foster interest in and to circulate information on all activities of the N.E.R. and its constituents, including the Hull and Barnsley. This compact and neatly duplicated periodical should go far to realise these objects. Details may be obtained from Mr. R. J. Hunter, 7 Almery Terrace, The Esplanade, York.

Crompton High-Wattage Lamps. This leaflet, issued by Crompton Parkinson Limited, Crompton House, Aldwych, London, W.C.2, describes the advantages of high-wattage lamps, the more important safety features being stressed. These include the use of a mica platform, for practical purposes invisible, as a safeguard against breakage at the end of the life of the lamp. The wattages and voltages in which these lamps are available are listed, together with the prices.

Tornado Blowers and Exhausters. The complete range of Tornado blowers and exhausters is covered in four catalogues issued by Keith Blackman Limited. Each catalogue is complete with specification, drive arrangements, capacity tables, dimensional drawings, and other technical details. The four publications deal respectively with cast-iron blowers and exhausters Type " N " with a volume range of 30 to 275 c.f.m., Type " MP " of 20 to 3,000 c.f.m., Types " 7," " 8," and " 9 " of 100 to 1,250 c.f.m., and steel-plate machines Types " 8," " 9," " 13," and " 14 " of 200 to 10,000 c.f.m. The large range of applications for which these machines are suitable include forced draught for various industrial processes, supercharging, cooling, and ventilation. A further publication is concerned with the Tornado Hydro Precipitator Dust Collector. This is a wet collector designed to remove dust from fine dust-laden air in, for example, foundries, and discharge it in the form of sludge.

A Complete Service in Industrial Heat Engineering. A well-illustrated bulletin, No. V.10.C, published by the Incandescent Heat Co. Ltd., describes a representative selection of the work handed by the companies forming the Incandescent Group. A separate section in the publication covers the products of each firm. Industrial furnaces and equipment for a wide range of industries and processes are included. Another section deals with electric furnaces for melting and a variety of industrial heating and heat-treatment processes in which Metalectric Furnaces Limited specialise. The range of industrial ovens for stoving and low-temperature heat treatment, and of filtration equipment, manufactured by Controlled Heat & Air Limited, occupies a further section, while the next section covers burners and various other heating appliances produced by Selas Gas & Engineering Co. Ltd. Other sections deal with the vitreous-enamelling service of Metal Porcelains Limited, and the nickel-chrome heat-resisting castings produced by Thompson L'Hospied & Co. Ltd.

Turners Duraglas Tapes. An illustrated pamphlet describes the series of Duraglas insulating tapes produced by Turner Brothers Asbestos Co. Ltd. of Rochdale. These glass tapes are designed for the insulation of the windings of traction motors and generators, and other heavy-duty machines. Recommended applications include those calling for Classes " B," " F," and " H " insulation, as defined in BS.2757, also Class " C " when impregnated with a silicone resin. The pamphlet gives the physical properties of the various sizes of tapes available, including construction, thickness, tensile strength, tolerances on thickness and width, and average glass content. The material specification and test methods used for the tapes are in accordance with the British Electrical & Allied Industries Research Association Specification No. A/S.79.

Pressure Grouting. The Wimpey Central Laboratory, Springfield Road, Hayes, Middx., has long been investigating pressure grouting with a variety of materials. An illustrated booklet obtainable from the Laboratory describes successful applications of pressure grouting to bridges, tunnels, and other structures; they include the sealing of a revetment in the dock of the Felixstowe Dock & Railway Company.

The research organisation of the British Transport Commission

An outline of activities carried out over a very wide field and in close contact with other scientific bodies and industry

ALTHOUGH the British Transport Commission relies to a large extent on its suppliers for research in the field in which each supplier is interested, some problems are of a nature which the supplier cannot undertake and in which research must be done with domestic resources.

Problems concerning the interaction of vehicle and track, rail stress, corrosion, maintenance troubles, the interaction between equipment supplied by different manufacturers, and field trials on all types of transport provide examples of fields in which the Commission must supply its own facilities.

Annual costs

The annual total cost of identifiable research and development within the Commission is approximately £2 million. This includes roughly £700,000 for research, the balance being in connection with engineering development. A large proportion of the expenditure is for day-to-day advice and investigation on routine matters.

Development also is undertaken by the Divisions of the Commission in the course of their ordinary work, and day-to-day expenditure in this field is not sufficiently identifiable to make an accurate estimate possible.

The proportion of its revenues that the Commission spends on research and development is relatively small compared with other industries because:—

1. Its primary function is to provide a transport service—not to manufacture;
2. Its suppliers undertake research and development.

Organisation

The organisation for research has been built up on the lines recommended by a committee of scientists, whose report was received by the Commission in November, 1948, and approved by the Minister of Transport.

This organisation is shown diagrammatically on this page. It will be noted that it provides for:—

1. A technical committee;
2. A research advisory council (and special panels);
3. A Chief of Research, assisted by a research co-ordination committee and advisory panel on electronic computing and control devices, and who has a small research department at Commission headquarters;
4. Separate research departments for British Railways and British Docks & Waterways, whose Directors of Research are directly responsible to the Chief of Research, also a Research Department for London Transport for which the Chief of Research has a co-ordinating responsibility as well as for the research activities of British Road Services, the omnibus groups, the Hotels & Catering Services and for electric traction research and operational research;
5. Electric traction research;
6. Operational research;
7. Development units.

The technical committee comprises members of the Commission. Its main function is to review technical questions of major importance, promote research and development, and recommend on matters of technical policy.

The research advisory council advises on matters of scientific policy, organisation, and the application of discoveries.

Joint meetings are held at regular intervals with the technical committee under the Chairman of the Commission.

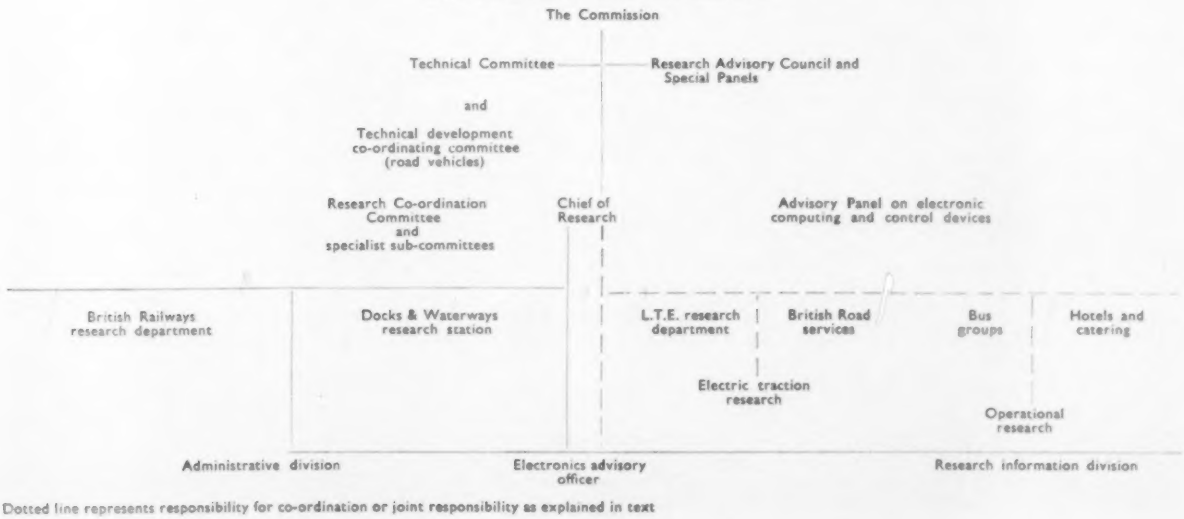
Special panels report to the council.

Sphere of responsibility

The Chief of Research is charged with the direction and co-ordination of the research effort of the Commission, to whom he is responsible. His duties include the preparation and presentation of research programmes and annual budgets for submission to the technical committee. He is also responsible for the co-ordination of research with technical development.

Reporting directly to the Chief of Research are the Director of Research, British Railways, the Director of Research, Docks & Waterways, the Director of Research Information, and the Electronics Advisory Officer. The principal activity of the former, who is also located at Commission Headquarters, is to give facilities for scientific research to every other department of the railways, both at Headquarters, and in the Regions,

B.T.C. ORGANISATION FOR RESEARCH



Dotted line represents responsibility for co-ordination or joint responsibility as explained in text

and to advise on scientific matters through research department membership of railway technical and other committees.

Two main fields of research

The Railway Research Department covers two main fields: (a) engineering, which comprises metallurgy, physics, and the interaction of vehicles and track, and (b) chemical services, which embrace the chemistry of corrosion, building materials, protective coatings, infestation, and textiles. The main laboratories of the department are at Derby; smaller laboratories are also provided at other railway centres. Railway electric traction is dealt with specially as below.

The Director of Research for Docks & Waterways is established at Bulls Bridge, Southall, where a new laboratory has been brought into use. This research organisation gives a service to the officers of the Docks & Waterways Divisions.

The research department of the London Transport Executive is an integral part of that organisation; the main laboratory is part of the Chiswick Works and provides a general scientific service for all departments.

The Chief of Research has a responsibility in respect of operational and traffic research. The control of the commission's operational research section has been placed with the Traffic Adviser but the Chief of Research assists the Traffic Adviser in this field.

The Chief of Research also has joint responsibility with the Chief Electrical Engineer of British Railways Central Staff for programmes and budgets for electric traction research, which has been set up to meet the needs of the expansion of electrification and to make full use of the potentialities of the a.c. system.

The Mechanical Engineering and Signal & Communications Departments have set up development units to manufacture and test prototypes of equipment embracing new ideas and principles, thus avoiding interruption to the main flow of equipment through the manufacturing shops of the Commission which are basically for maintenance and small-scale production.

Use of computers

To ensure that full advantage is taken of the potentialities of computers, the Commission has set up a special advisory panel under the chairmanship of the Chief of Research, assisted by the Electronics Advisory Officer. This body surveys the computer field, receives reports on the behaviour of computers throughout the organisation, stimulates new applications in this field, and generally holds a watching brief over the whole of the activity.

There are no separately identifiable research departments forming part of the remaining organisations of the Commission. In British Road Services a considerable amount of investigation and development in the design and performance of materials is carried out by the engineering staff in association with the vehicle manufacturing industry and with the other road transport operation divisions of the Commission, particularly those of British Railways and London Transport and of specialised road vehicle organisations and individual consultants.

The research and development work of the road transport organisations is also kept under regular review.

Co-ordination

In a diversified organisation such as the Commission, it is necessary to make sure that the work of the research departments is adequately co-ordinated and that there is a suitable forum for the discussion of developments and the exchange of technical experience of mutual interest. For this purpose, a research co-ordination committee has been formed and meets monthly under the chairmanship of the Chief of Research. It comprises the directors of the Research Departments and other officers responsible for research activities. The committee discusses programmes of research and other matters of technical and scientific interest and reports on the progress of investigations to the technical committee and the Research Advisory Council. It has a number of specialist sub-committees dealing with particular subjects, which include the development of materials, their protection and cleaning, lubrication and fuel economy. The Research Co-ordination Committee also supervises extra-mural research investigations placed with the universities and other external research organisations and for which a special annual block grant is authorised.

Contact with other scientific bodies

The Commission keeps in touch with the facilities available for research in the country as a whole, and contact is maintained at all levels with the Department of Scientific & Industrial Research, the National Research Development Corporation, Defence, and other Government establishments. In addition, the Commission is a member of about 30 of the research associations.

The Commission contributes to the upkeep of the Office for Research & Experiments (O.R.E.) set up by the International Union of Railways to undertake co-operative research on common and technical problems and pool means of technical research. The Commission also is a member of the American Association of Railroads.

The more important projects concern permanent way. New forms of motive power, particularly those with smaller wheels than the steam engine, introduce unknown stresses in track. These can now be accurately measured and their effect on the life of rails assessed. The introduction of long-welded rail also raises its own problems. The problems of riding and improving comfort are actively in hand. The scientific background to the dynamic problems involved is still obscure and very difficult, and a long-term research project is in hand, assisted by a leading university.

A series of projects is in hand in connection with the modernisation of the wagon fleet, including the improvement of brakes and the development of various kinds of couplings and buffers.

A development aimed at economy in the maintenance of diesel engines involves the use of a spectrograph to analyse oil in the crankcase. By this means, contaminants arising from wear can be pinpointed in character and degree and an estimate made whether an engine is due for overhaul. Two such spectrographs are at work, and in the near future it will be possible to see whether engine overhaul can be controlled by this means.

Co-operation with industry

Not the least advantage of the 25-kV. system of electrification lies in its potentialities for technical improvement. The advent of the power-controlled rectifier in semi-conductor materials opens the way for considerable lowering of capital cost and increase in reliability by the use of similar types of motor. Industry substantially co-operates in this project.

In the operational research field the most lucrative investigation has been in the application of computer techniques to the control of wagons. In one district, some 12 per cent of wagon-mileage has been saved, and these techniques are being extended to other districts. It is now possible to prepare timetables by these machines and this time-consuming work can now be considerably shortened. Routine application of computers, of which the Commission has eight, is growing.

Development is in hand of an automatic system of identification of wagons, the objective being increased detailed knowledge leading to greater efficiency of use. System studies are well under way regarding the best use of the information now to be available.

These projects alone, if fully applied, can go far to pay for the whole cost of research.

London Transport

London Transport undertakes research into low-viscosity oils for lubrication, road vehicle fuel consumption, exhaust smoke emission, strain-gauge techniques on equipment, use of polyester glass laminates, rail de-icing, tyre-testing, etc. Investigations are also made into the effect of traffic congestion on bus operation, traffic services, bus and escalator accidents to passengers, driving techniques, and the handling of lost property.

A major project arose from the evaluation of stresses in the underground rail-

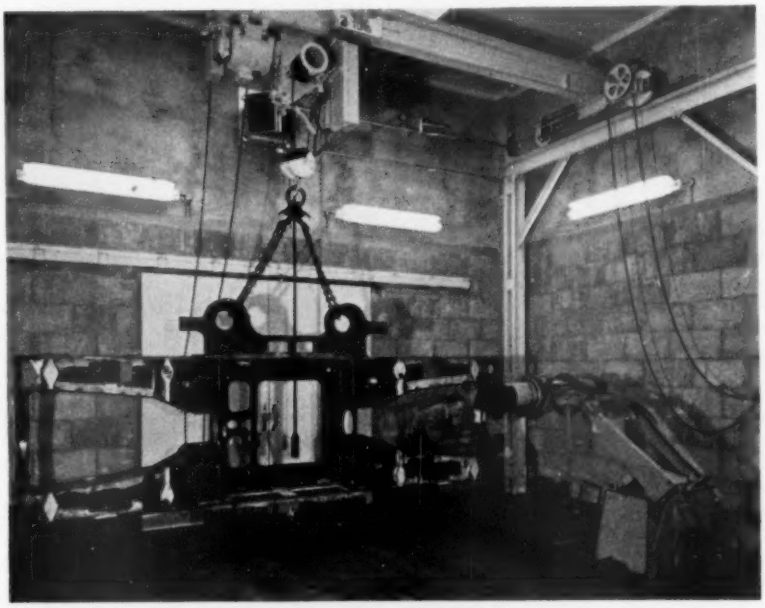
Continued on page 397

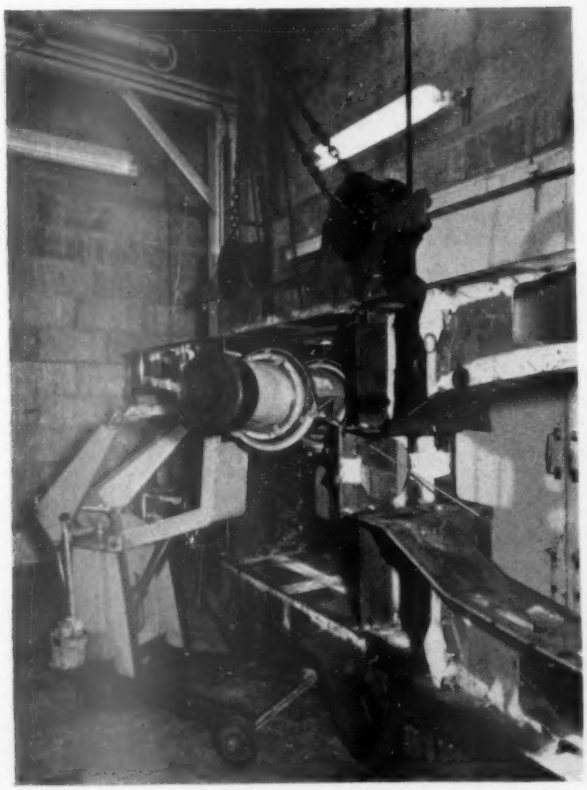
WELD EXAMINATION BY X-RAY on Western Region

Equipment for examination of fabrications at Swindon locomotive works facilitates very close quality control and inspection

THE use of welding as a manufacturing process has been considerably extended in the Western Region by the change-over from steam to diesel-hydraulic locomotives of lightweight construction. Welded fabrications are in most cases considerably lighter than castings or forgings of equivalent strength, due to the better distribution of load carrying members. The welding on a production basis of stressed components has necessitated very close quality control and inspection. Visual inspection is not satisfactory as the external appearance of a good weld may well be identical with that of a defective weld.

This difficulty is overcome by the use of industrial X-ray equipment and a good example of this on a production basis is in





(Top) : preparing bogie frame for examination in X-ray room. (Bottom left) : lifted by hydraulic ram, tube head is positioned and focused. (Bottom right) : remote control for X-ray apparatus

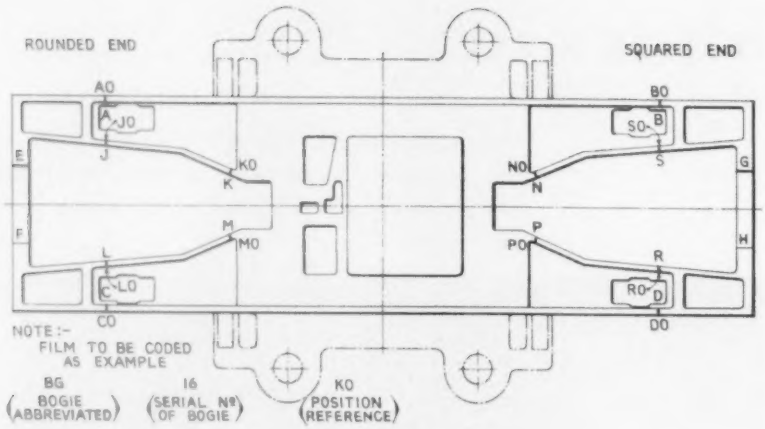


Diagram showing coding and position of photographs

operation at the Swindon Works of British Railways, Western Region.

A detached brick building, 25 ft., 29 ft. and 20 ft. high has been constructed. The walls are lined with barium brick to a height of 13 ft. and the doors are lead-lined. The control equipment is housed in an adjoining room and interlocking switches on the doors prevent turning on of the operating current until the X-ray room doors have been closed. When the current is switched on a warning light shows on the door and an audible warning is also given.

Radiation detection

Operators of the X-ray equipment each carry a radiation-detector lapel film badge, which is examined at two-weekly intervals by the Radiological Protection Service of the Medical Research Council.

Heating is by blower-fan steam radiators in the X-ray room and radiant-panel electric heaters in the control and film developing rooms.

The X-ray unit is a Philips Compactix 200 which has a continuous rating of 200 kVp 10 mA. At this rating it is possible to radiograph mild steel up to 3 in. thick in an economical exposure time. The penetration can be adjusted by altering the tube voltage from 70 kV. to 200 kV. and the tube current from 5 mA. to 10 mA. The unit is equally suitable for light alloys and will operate in a wide range of ambient temperatures.

Easy positioning

The head is mounted on a four-wheel trolley; the tube is carried horizontally in a cradle attached to two pivoted arms. These are positioned by a hand-operated hydraulic jack, and the tube may be rotated to any position. The cylindrical casing is divided into three compartments, with the X-ray tube surrounded by a lead shield in the centre, and an h.t. transformer at each end. The three sections are oil jacketed, and the oil is cooled by water circulation through an external cooling unit. This is in the form of a wheel-trolley fitted with supply tank, radiator, and motor-driven circulating pump and fan. Self-sealing couplings are used on the hose connections.

With the head cradle mounted on the trolley, the range of adjustment is between 12 in. and 5 ft. from floor level. Accurate direction and positioning of the tube head is obtained quickly by the use of a focusing rod inserted in a carrier on the tube casing. The universal-head Mounting is then locked and the trolley brakes applied. Sling attachments are provided to enable the head to be slung from an overhead crane when working on large fabrications.

Operating controls

The operating controls are housed in a ventilated portable cabinet. Separate lids are provided for the supply and output plug-in connections, and for the working controls, fuses, and instruments. Exposure times may be controlled manually or by a 0-30 min. automatic timer. The automatic safety features include a cut-out switch for excessive cooling-water temperature. As the h.t. transformers are incorporated in the X-ray head, flexible low-tension cables only are required between control unit and head.

The bogie frame illustrated is a typical example of a routine weld examination. The radiographer is supplied with the drawing, showing the welds to be photographed and the coding to be used on the filmed record. In this case the average plate thickness is $\frac{5}{16}$ in. and the exposure time about 1 min. for each of the 16 welds examined. A lead intensifying screen is used in conjunction with Kodak Industrex D film.

Other components examined are engine mountings, axle housings, and underframes. The underframes are X-rayed on the shop floor; this work is carried out when normal work in the shop has ceased. To enable the work to be extended to the examination of welds which are inaccessible with the present head, a smaller head the 150 kV Philips-Müller rod anode type is being obtained. With this equipment the h.t. generator is mounted separately from the head. All X-ray work at Swindon is controlled by the Chief Instructor of the welding school.

ANGLO-BELGIAN CO-OPERATION

From March 26, British Railways and the Belgian National Railways, in conjunction with Channel Air Bridge Limited, have provided ten daily services in each direction between Britain and Belgium. Operating on the London-Southend-Ostend route, the services offer journey times from London to Brussels of from 4 hr. 22 min. to 4 hr. 52 min. A rail-air-rail ticket—the first to be issued in Europe—simplifies ticketing arrangements. Through booking can be made at the British Railways Continental Ticket & Information Bureau at Liverpool Street, at other Eastern Region stations, at Channel Air Bridge Limited, 21, Wigmore Street, London, and at principal travel agents. The fares cover road transport between airports and stations.

BRITISH TRANSPORT ADVERTISING RATES TO INCREASE

The British Transport Commission is to raise the advertising rates charged by British Transport Advertising as from July 1. From that date, an advertisement on the side of a London red bus will cost £1 a week or £52 a year—the present annual rate is £45. Underground escalator panels will cost £16 a year for from 50 to 99 instead of £14; for 100 to 149, the cost will be £15 10s. instead of £13 10s., and for 150 and over, the cost will rise from £13 to £15. Rentals for poster sites on British Railways stations and properties will also cost more.

RUSSO-TURKISH RAIL LINK

A Soviet delegation of 10 men arrived in Ankara last week for discussions with experts to improve railway facilities between Turkey and the Soviet Union. The delegation is headed by Mr. Ushakov, Assistant Chief of the Internal Communications Department of the Soviet Union. His Turkish opposite number is Mr. Vahid Halefoglu, Director-General of the first department of the Turkish Foreign Ministry, who will act in a co-ordinating capacity. A Russian embassy spokesman has stated that the chief object of the talks will be to enable Turkish nationals to take through tickets from Ankara and other Turkish cities to the Soviet Union and vice versa. This is not possible at present.

HEAVY-DUTY RAIL CLIPS with cast-iron baseplates

Some particulars of an easily-applied rail fastening widely used on wood and concrete sleepers

Main-line concrete-sleeper assembly Eastern Region

AMONG the types of rail fastening assembly now used by British Railways for new plain track installations, one which has developed rapidly in recent years is the Mills rail clip and baseplate. First introduced in 1956, these can be seen already on some 400 miles of main-line track in Britain. By far the largest user is the Eastern Region, where most are on wood sleepers, and long lengths of the East Coast main line are now laid with welded rails, Mills clips and four-screw baseplates with resilient rail pads, and close-spaced jarrah sleepers. All other Regions have track fitted with Mills clips and baseplates, some in very considerable quantity, with various detailed alterations in the assembly; these include applications with jointed and welded rails, with and without resilient rail pads, on two designs of concrete sleepers, as well as those of softwood and hardwood, and for third rail electrified track.

Indirect fastening

The Mills clip is primarily designed as an indirect rail fastening for use in conjunction with cast-iron baseplates. Cast iron, for various reasons, has been the traditional material for rail supports in Britain for very many years, and the iron baseplate with spike-type fastenings for flat-bottom rails has successfully followed the heavier bull-head rail chair. Many of the indirect types of rail fastening have been developed for the steel baseplates generally used abroad, and are less suitable for cast iron, which has excellent properties in compression but is comparatively weak in tension. The Mills clip in position exerts only a compressive load on the casting, on the shape of which the unique action of the Mills assembly depends.

Typical baseplates

The drawing shows the typical Mills baseplates, which may be secured to the sleeper by screws, bolts, spikes or other preferred means. The spring-steel C-shaped clip is made with a gap between upper and lower arms a little greater than the thickness of the outer ends of the tapered shoulders on the baseplate. One or two hammer blows drive the clip into an intermediate position at which the upper arm is still well clear of the rail foot and the clip is expanded sufficiently to retain it positively in this position, assisted by the special shape of the shoulder, as shown on the left-hand side of the sectioned view. Further hammer blows drive the clip through a position of maximum expansion beyond which it clamps into engagement with the rail base, at a substantially lower working expansion of the order of $\frac{1}{8}$ in., at which

Track on concrete sleepers London Midland Region

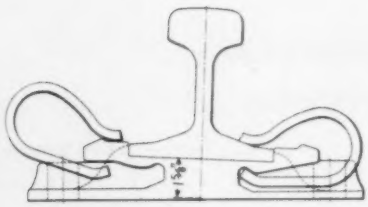
Electrified track Southern Region

Bow Junction, Eastern Region

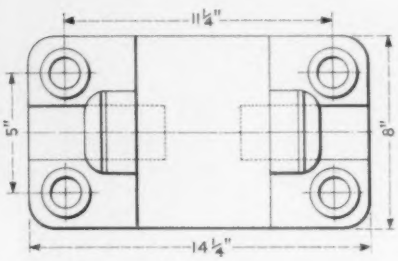
each clip applies a vertical load of some 15 cwt. on the rail base. The fully-home position is seen on the right-hand side of the drawing.

Working deflection

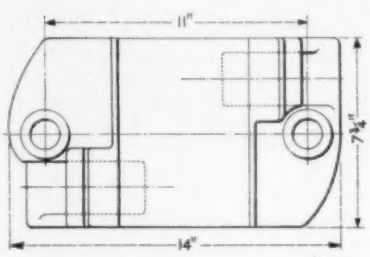
The high working deflection for which the clip is designed allows for manufacturing tolerances in all components; every clip, fitted by ordinary hammer, exerts a load on the rail within a known range, and a high degree of vertical resilience is combined with the absolute prevention of creep of the rail relative to the baseplate under service conditions. This results solely from the design and manufacture of the components; no gauges or adjustments are involved in fitting or in maintenance, and there is no possibility of incorrect fitting. Removal of the clip from the rail or from the baseplate can be performed with a convenient specially-designed lever-type tool, or with a conventional crow-bar. Such an assembly accords with modern track practice, including pre-assembly in depots and the replacement of standard-length rails by long welded rails. Rails can be quickly released, for turning, changing or de-



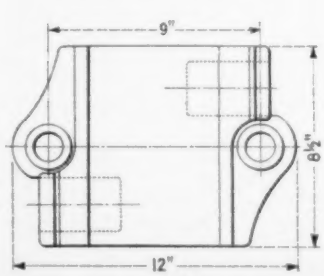
Application of clips



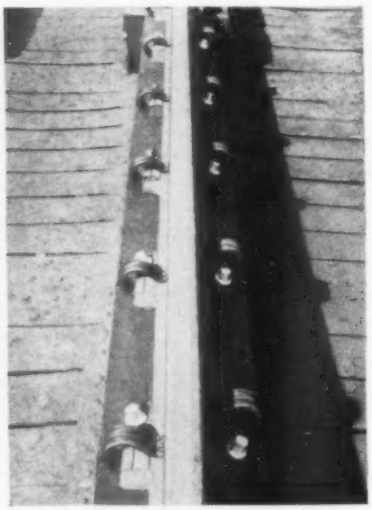
MRC 2 for wood sleeper



MRC 4 for E4 sleeper



MRC 6 for F7 sleeper



Baseplates on longitudinal timbers, North Eastern Region

stressing, without removing the clips from the baseplates and without disturbing the sleeper fastenings. The clips are said to be virtually unaffected by repeated removal and re-application, because of their high strength and spring rating, so that such operations if necessary can be repeated many times without detriment to the performance of the fastening. The Mills assembly, it is claimed, provides exceptionally good location of the rail against lateral thrust, slewing, buckling or loss of gauge, by reason of the deep full-length double shoulders of the baseplates.

Concrete sleepers

Although heavy baseplates are usually associated with wood sleepers, the Mills assembly also claims some important advantages when used with concrete sleepers. The first design of Mills baseplate to be developed for concrete sleepers was the type MRC.4 for the E4 type sleeper. The position of the screws is the same as in the corresponding bull-head rail chair,

Cast-manganese crossing, Scottish Region

Measuring applied load, Western Region

and so permits the E4 sleeper to be used with flat-bottom as well as with bull-head rails. For main-line use the MRC.6 baseplate has wider application. This is of comparatively small area, with screws more closely spaced, and is, like the MRC. 4, canted for use on a sleeper with horizontal top. The same clip is used with concrete as with wood sleepers, so that one rail fastening can be standardised for both types. Insulation of the baseplate for electrical track circuiting can be carried out satisfactorily. The uniformity of the load applied by the clips to the rail at every sleeper is particularly valuable when the concrete or wood sleepers are used with long welded rails, as full advantage is thus taken of ballast/sleeper resistance throughout the length, making for uniform distribution of stress along the rail.

Special track

Several applications of Mills clips have been developed for special track work. Their high resilience and strength make them suitable for the exacting demands of points and crossings, and they have been used for some large new installations, such as the platform approaches at Liverpool Street Station. Here, and in other parts of Britain, considerable numbers of cast manganese-steel crossings are fastened by Mills clips, while the MRC7 baseplate, specially designed for use on narrow longitudinal beams, has an important application at Selby swing bridge on the East Coast main line, North Eastern Region. Another particular requirement has been met by a special design of Mills baseplate in Nigeria; on open deck bridges rail fastenings are easily lost during track maintenance work, and the shape of the tapered shoulder on the Nigerian baseplate is so arranged that the clips, when once driven on, can only be transferred between the working and intermediate positions, and never removed entirely from the baseplate by ordinary track tools.

The Mills clip is made of special ribbed-section spring-steel bar, having a width of 2⅛ in. and thickness of 15/32 in., heat treated. It generates its grip between the extremities of the upper and lower arms, not relying on any contact with the baseplate except directly under the point of application of load on the rail foot. It is a single-piece fastening, fully elastic up to an expansion of ½ in., so that the elastic limit is barely reached in the course of fitting and removal. The working expansion of ⅜ in. is well below the elastic limit, which is further guaranteed by the automatic pre-setting operation of driving the clip over the high shoulder of the baseplate. The lower arm has an upturned end which engages with a corresponding upward inclination in the baseplate holes. The degree of this inclination exceeds the angle of the upper surface of the rail base with which the upper arm of the clip engages, so that the clip is positively retained in its working position well clear of the high shoulder of the baseplate. The ribbed-section of the bar has been designed so that tension and compression stresses in the back of the clip are approximately equalised, with the result that maximum stress in the clip is reduced under working conditions.

Designs available

The Mills baseplate, of which some dozen designs are already available, is preferably of cast iron, and is more resistant to corrosion than ordinary steel. In each design blind holes receive the lower arms of the clips, locating them against twisting or other displacement, yet allowing vertical clearance so that each clip is self-adjusting to apply only a compressive load on the casting. No machining or special preparation is required, and normal casting tolerances are permissible. Ferrules of wood or other material, as in general use on British Railways, can be used. The bearing area and number and position of holes for fastenings can be varied according to individual requirements for wood or concrete sleepers, or special track work, and vertical dimensions adjusted to accommodate a resilient pad under the rail base if desired. Weight of a typical baseplate is 25/40 lb. according to design. The shape of the baseplate shoulder above the blind holes ensures ease of driving and removal of the clips, their positive location in the intermediate and working positions, and provides that every clip, in the course of fitting, is automatically tested about ⅛ in. above the working expansion on the actual baseplate with which it is to be used; it follows that every spring clip in the track is working always well within its elastic range.

Production

The Mills clip is produced by Executors of James Mills Limited, which is also responsible for the conception of the assembly as a whole and which has some 35 years of experience in the design and manufacture of spring steel permanent way fastenings. Development and manufacture of the baseplates is undertaken at the associated foundry of Guest, Keen & Nettlefolds (Cwmbran) Limited. Both clips and baseplates have been fully tested under static and dynamic conditions. A simple device allows an accurate measurement to be taken of the load actually applied to the rail by these clips when fitted in the track. Four years' experience on heavily-used main lines indicates that this assembly will withstand arduous conditions in service, and that the greater first cost of an indirect-type rail fastening can be well justified.

The photographs in this article are reproduced by kind permission of the following Regional Chief Civil Engineers; Mr. A. K. Terris, Eastern Region, Mr. A. N. Butland, London Midland Region, Mr. E. L. Triffit, North Eastern Region, Mr. M. G. Maycock, Scottish Region, Mr. A. H. Coutrell, Southern Region, Mr. M. G. R. Smith, Western Region.

The research organisation of the British Transport Commission

Concluded from page 392

way stock, and the replacement of steel springs in the suspension by rubber is now a routine matter. New stock under order includes these developments. The saving of fuel consumption as a result of low-viscosity oils in the London bus fleet amounts to substantial annual sums.

The organisation gives a service to the engineers and others of the Docks & Waterways Divisions. Subjects dealt with include bank protection, pollution, silting, dock gate corrosion, and design of barges.

In addition to their main task of production and installation of equipment for the modernisation plan, the engineering departments are responsible for bringing to fruition the results of research, which is termed " development."

The closest liaison, therefore, must be achieved between them and the research department. To this end, representatives of the research department are members of a number of railway engineering committees. In addition, members of the engineering committees and departments attend internal discussions of the research department and are members of some of the working parties and committees.

The correct balance between duplication of effort and restriction of initiative is not an easy one to define or to achieve. If too great a freedom is given for local initiative, an uneconomic duplication of effort can arise but a certain amount of duplication does no harm, and indeed may be an incentive, provided it is not carried too far. The divisions of the Commission not only undertake certain research on their own accounts, but are asked from time to time to undertake specific projects by headquarters, where these have particular local application. In such cases, they find their own finance if necessary and are asked to report currently the results of their work to headquarters. The larger items may involve expenditure beyond local powers, in which case central authority for finance is sought and almost always given.

UNDERWATER INTERLOCKING

Emergency facilities installed on Norfolk & Western Railway, U.S.A.

PERIODIC flooding of the permanent way necessitates special interlocking facilities to permit signal-and-point operation when track circuits are unworkable. These conditions obtain at Union Station, Norfolk, on the Norfolk & Western Railway, U.S.A. Certain combinations of wind and tide cause salt water to rise round the rails and, although not completely submerged, the tracks are shunted.

To facilitate working of points, emergency facilities have recently been introduced. A pushbutton is provided in a telephone box near the points. The train staff informs the signalman by telephone of the desired movement. The signalman operates the switch lever and presses a button which must be a collateral operation with the trainman working the button at site.

Clearing signals

Under these conditions, signal 38L leading into the station may be cleared to a restrictive aspect, having call-on control. Signals 38R for movement out of the station cannot be cleared, and hand signalling has to be used. The points are electro-pneumatically operated and the switch-circuit controller and valves are mounted above highwater level. The pneumatic point motor is not seriously affected.

Similar emergency interlocking was introduced at Grant Road Station, Bombay, on the former Bombay, Baroda & Central India Railway in 1929 when the installation of colour-light signalling and continuous track-circuiting throughout the suburban area was in progress.

Location cubicle at points, showing switch controller fixed on brickwork above flood level at Grant Road Station

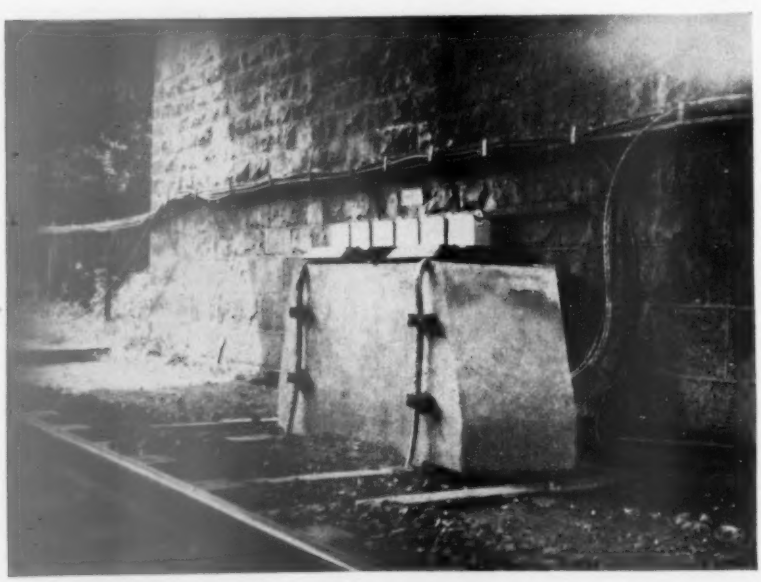
During the monsoon, rainfall of over 100 in. is experienced. A combination of several days' continuous rain and high tides would flood the tracks between the limits shown to a depth of several feet, platforms being approached in both directions by a falling gradient.

The manual signalbox (formerly "B" box) was retained for manually working points and signals at the north end not indicated in the diagram. The facing points on the Down slow line are worked by all-electric switch-machine controlled from the mechanical lever frame. This frame has an emergency lever locked normal by a key lock. This key is kept by the stationmaster in his safe. When flooding occurs he takes the key to the signalbbx, inserts and turns it in the lever lock permitting the lever to be reversed.

A circuit controller operated by the lever shunts out the various controls affected by the failed track circuits. Signals "A" to "F" can then be operated. Station standing orders for emergency working stipulate precautions to be taken.

Protecting ground equipment

Ground equipment suffered in floods, particularly the impedance bonds situated between the rails. These generally filled with water and, after the floods had subsided, maintenance staff spent many hours drying the bonds out. In 1935 they were removed from the track and elevated above highwater mark by concrete piers. The point machine controller was also lifted above flood level in a similar manner.



Impedance bonds elevated above flood level on concrete plinths

ELECTRIC RAILWAY TRACTION SECTION

Electrification in South Africa

THE end of the approved electrification programme to which the South African Railways Administration has been working is now in sight. Originally, some £20 million was provided for electrification and nearly £15 million has been spent. The main work currently in progress is the electrification of the Touws River-Beaufort West section of the Cape Town-Johannesburg main-line, but smaller projects in Natal and on the Cape Suburban System are well advanced.

The last financial year, which ended on March 31, 1960, was a record for electrification. During that year, 239 route-miles of electrified track were added, bringing the total to 1,199 route-miles. The electrification of the 179-mile section between Touws River and Beaufort West on the Cape main line is the largest single stretch ever to be undertaken by the South African Railways. Supply depots have been opened at Beaufort West and Laingsburg and preliminary work has been completed. Electric locomotives will be hauling trains northwards as far as Leeugamka by July this year, and the whole £3 million project is planned for completion before the end of 1961, which will mean electric traction over a distance of 339 miles from Cape Town.

The electrification of the Cape Town suburban lines (to non-white residential areas) and of the sections Cape Town-Langa-Nyanga, Langa-Bontheuwels-Nyanga and Bontheuwels-Kasselsvlei-Bellville is scheduled for completion before the end of this year. A total of 222 route-miles will be added to the electrified network in the Cape when the work is finished.

In the Transvaal 126 route-miles of electrification were added during the year ended March 31, 1960; the two longest sections were Midway-Vereeniging (including Residensia-Grasmere) 33 miles, and Wattles-Vereeniging, 30 miles. The lines serving the coalfields of the Eastern Transvaal from Ogies to Broodsnyersplaas and Welgedag to Witbank have been electrified at a total cost of £2,690,900.

The increase in electrified route-mileage in the Transvaal and Orange Free State for the year totalled 210, and electrification now extends from Witbank on the East to Klerksdorp in the west and from Pretoria to Kroonstad.

A route mileage of 42 was added to the electrified network in Natal during 1959-60 with the opening to traffic of the Rossburgh-Cato Ridge (via Hillcrest) section. The authorised electrification programme for Natal includes the Durban-Duff's Road and Umgeni-Duff's Road sections. This work is planned for completion before the end of 1961. Natal has the longest single stretch of electrified track in the Union at present. The Johannesburg-Durban main line is electrified from Durban to Volksrust on the Transvaal border, a distance of 321 miles, and the Orange Free State electrification extends as far as Harrismith, a distance of 263 miles from Durban.

To the end of March, 1960, electric locomotives had run a gross total of 452,065,583 miles and motor coaches 376,340,001 miles since the introduction of electric traction on the South African Railways in 1926. The highest mileage recorded by any one electric locomotive was 2,654,816, and that of any one motor coach 1,823,345.

The ton-miles operated under electric traction increased from 11,933 million in 1958-59 to 14,330 million in 1959-60. The number of suburban passenger journeys on the Cape Town and Witwatersrand electrified services increased from 215,987,996 to 232,956,691.

The electric locomotive buying programme has been impressive. During the 1959-60 financial year 80 electric locomotives were placed in service, bringing the total at March 31, 1960, to 472. Between April 1 and November 30, 1960, a further 46 were added; 42 are on order and will be in service by the end of May, 1961.

Indian railway electrification

AN indication of the progress being achieved by the railways of India is evident in the electrification now being carried out under the Second Five-Year Plan of 668 route-miles of the Eastern and South Eastern Railways on the a.c. system. It is intended to augment this work by a further 205 route-miles early in the Third Plan period. Because of the magnitude of the work and the new technique involved, it was considered desirable to obtain technical collaboration and, because of its pioneer experience with the 25-kV. system, this is being provided by the French Railways.

As the Eastern and South Eastern Railway administrations could not undertake the electrification project in addition to their existing responsibilities, the Railway Board established a separate Railway Electrification Administration under the overall control of a General Manager & Chief Engineer, a procedure which is interesting in the light of the contention expressed by Monsieur Vaubourdolle of the S.N.C.F. at the British Railways Electrification Conference that a *chef d'orchestre* with overriding control is essential to the efficient undertaking of an electrification project. A number of officers and members of the staff of the new administration was sent to France for specialised training before commencing the construction work. While civil, electrical, and signal and telecommunication engineering works were undertaken departmentally, the supply and erection of much of the overhead equipment was undertaken by foreign contractors who also undertook the survey and design work for the first 458 route-miles.

Having gained experience during this period, the Railway Electrification Administration took over the survey and design for the remaining 210 route-miles. By December last year, 96 route-miles (260 single-track-miles) had been completed. Of the 110 locomotives ordered from abroad, 95 had arrived in India and 20 were in commercial service.

The designs adopted for the a.c. system in India follow very closely the French pattern. Power supplies are tapped directly from the 132-kV. grid lines, outdoor-type equipment is used for the sub-stations and paralleling posts, neutral sections are provided only at the mid-point paralleling posts and the same simple switchgear protection scheme is considered adequate under Indian traffic conditions. The nature of the subsoil and the Indian climatic conditions posed some special problems in respect of foundations for overhead line structures. Fabricated structures, broad-flanged beam sections, and rolled steel joist sections have all been used for structure masts, but broad-flange beam sections are now to be abandoned until such time as they can be produced in India. A section is to be equipped experimentally with precast concrete masts.

The locomotives are of the Bo-Bo type, equipped with four single-anode ignitron rectifiers. One hundred locomotives, each with a continuous rating of 2,090 kW. are being supplied by a European group of contractors and 10, each with a continuous rating of 2,100 kW. are being supplied by Mitsubishi.

Jungfrau Railway Motive Power

Europe's highest railway acquires new stock to take full advantage from the national electricity network

In its 63 years of electric operation the Jungfrau Railway, which combines the features of being Europe's highest railway and one of the principal tourist lines on the Continent, has seen various changes in its characteristics and motive power.

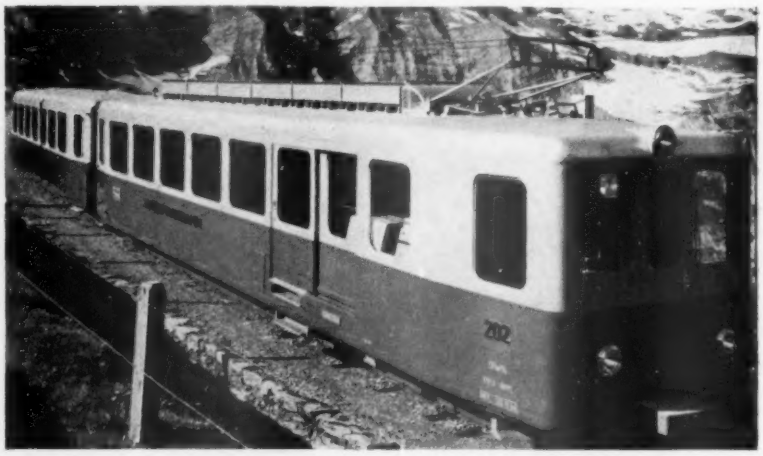
Originally, it was a rack-and-adhesion line, for between Eismeer Station, inside the final tunnel, and the summit at Jungfraujoch, the track was adhesion only, though gradients were 1 in 10 to 1 in 15 on that section. Below, on the rack division, gradients were as steep as 1 in 4. After the 1939–45 war, a decision was made to put a rack on this final section. Since then, the line has been operated as a pure rack railway. In the early 1950's the 12 existing locomotives were converted into simple rack units having two speed steps of 5·6 and 11·2 m.p.h.

From regular operation beginning in 1898, the Jungfrau Railway was operated with three-phase a.c. at 650 V. 40 cycles, the current being supplied by the railway's own power station. As increased traffic made the power supply more difficult, it was decided some years ago that a change must be made from 40-cycle to 50-cycle current, so that additional power might be obtained from the Swiss general electricity network. Changeover to the new conditions took place on November 3, 1960. Since then, the railway has been operated at three-phase 650 V. 50-cycles. To adapt the speed of the existing locomotives to the changed periodicity of the supply, which results in an increased motor speed, gear ratio had to be modified by new gear wheels; so far, six of the locomotives have been altered.

Modernisation in 1953

In 1953, modern motive power was ordered in the form of two trains. Each comprised a motor-coach and a control trailer. The mechanical portions of the motor-coaches were built by the Swiss Locomotive & Machine Works (S.L.M.), and the Swiss Car & Elevator Company, of Schlieren, built the trailers. Brown Boveri (B.B.C.) electrical equipment was installed. The dimensions of the tunnel and the galleries called for a special construction, the roof having to be kept very low and the entire power unit built in to one bogie. Because these trains were built for the original 40-cycle current, a number of gear wheels had to be replaced with others of different ratio to suit the increased traction motor speed.

After two years' experience with this



equipment, a repeat order was placed for four trains to suit 50-cycle supply. Of these, two were put in operation when the changeover in supply took place last year, and the two remaining sets are now in course of delivery. Apart from changes necessitated by the change in supply frequency, the two batches are more or less identical.

The new trains

The 1960–61 motor-coaches, of bogie type, are 46 ft. 6 in. long over body and seat 21 passengers in a single saloon plus another four on hinged board seats in the vestibule. Empty weight of a motor-coach is 23½ tons. The equipment has a 1-hr. rating of 600 h.p., and gives two speed ranges of 7·5 and 15 m.p.h. The motor-coach is at the downhill end of the train, and in it the power equipment is concentrated on the bogie at the lower end. The upper end trailing bogie was built by Schlieren, otherwise the new motor-coaches were constructed by S.L.M. and, as in the previous order, B.B.C. supplied the electrical equipment and Schlieren the trailers.

The equipment on the bogie projects through the car floor, but is encased so that this machinery compartment is available as a luggage and parcels room. The driving bogie is of S.L.M. type with welded box-section frame. The cylindrical axlebox guides are surrounded by helical spring groups, with the body carried on two side bearers supported by laminated springs.

The high-speed high-level fully-spring-borne traction motor drives the rack mechanism through a two-speed gear to which two axle drives are connected by cardan shafts. Selection of fast or slow speed is obtained electro-mechanically by an electric servo-motor mounted on the gearbox, which actuates the friction clutches through a cam disc and control levers.

To comply with the braking requirements for rack railways of the Swiss Federal Transport Board, there are three independent retardation systems, though not one of these acts on wheel-rim blocks. They are: (*a*) electric combined regenerative and resistance brake; (*b*) ratchet brake on the axles, operated by a hand-wheel in the cab, or by spring power released by solenoids through a centrifugal switch when the permissible maximum speed has been exceeded, or by one of the other safety devices such as the deadman pedal (this brake is intended as an automatic brake for the downhill journey); (*c*) transmission brake acting on a drum fixed to the cardan shaft, operated by hand from the driving position, or by spring power released by solenoids with a pushbutton actuation, and serving as a safety or emergency brake for the uphill journey—it can be operated also from the driving position in the control trailer.

Electrical Apparatus

Electrical equipment is simple, with only one four-pole induction traction motor with slip-ring rotor. Control is through a 22-notch controller, by which starting resistances on the roof are successively cut out.

A 36-V. battery, charged through a selenium rectifier according to the power consumption, supplies the current for the control circuits, lighting and other services. The source of heating is direct from the overhead line supply, and the heat can be regulated in three stages.

PERSONAL

Overseas

MR. ALFRED GILMORE, Secretary of the Victorian Government Railways, who, as recorded in our March 24 issue, has retired, joined the Department in 1911. He gained wide experience in the Rolling Stock Branch at various workshops and running sheds and as Personal Secretary to the Chief Mechanical Engineer. As a clerk on the staff of the first Electrical Running Inspector, he was concerned with the introduction of electric traction on the Victorian Railways. He transferred to the Secretary's Branch in 1933 as Personal Clerk to Mr. N. C. Harris, then a Commissioner. In 1955, Mr. Gilmore became assistant to Mr. R. G. Wishart, then Commissioners' Special Officer. In this position, and as Secretary of various departmental committtees, he enlarged his knowledge of railway finance and general administration. In 1947 he was appointed Commissioners' Secretary. In this capacity he accompanied an official delegation to South Africa to investigate main-line electrification, as a prelude to the electrification of the Gippsland line. In 1950 he was appointed Commissioners' Special Officer, in which position he has

Mr. Alfred Gilmore

been actively associated with the organisation and financing of the Department's £A80 million rehabilitation programme. He became Secretary of the Victorian Government Railways in 1958.

MR. JOSHUA BRADLEY, Assistant Chief Mechanical Engineer, Western Australian Government Railways, who, as recorded in our March 24 issue, has retired, was born and educated in England, and after serving an apprenticeship with the Vulcan Foundry Limited, he joined the Royal Air Force during the 1914-18 war. He spent 10 years as Planning Engineer with Sir. W. G. Armstrong Whitworth & Co. Ltd., and in 1928, was appointed Production Engineer, Madras & Southern Mahratta Railway. He served in a number of positions on that railway, before being appointed Chief Mechanical Engineer in 1948. He resigned in 1949, owing to changed political conditions, and returned to England. For some years before leaving India he was a Member of the All India Railway Standards Committee, dealing with new designs of rolling stock, and modifications thereto. In 1950

Mr. Joshua Bradley

he became Assistant Chief Mechanical Engineer, Western Australian Government Railways, and, in 1958, was appointed Chief Mechanical Engineer. From 1942 to 1946, Mr. Bradley held the rank of Major, Royal Indian Engineers, and was in charge of all air raid precautions.

MR. W. N. STEPHENSON, Projects Officer, Transport Superintendent's Office, New Zealand Government Railways, has been appointed Assistant Transportation Officer, in succession to MR. W. J. THORN, who, as recorded in our March 24 issue, has retired.

MR. S. GRIFFITHS, M.I.LOCO.E., A.M.I.MECH.E. Assistant Chief Mechanical Engineer, Motive Power, Western Australian Government Railways, who, as recorded in our March 24 issue, has been appointed Chief Mechanical Engineer, was educated at Perth Modern School and Perth Technical College. He served his apprenticeship in the Midland Junction Railway Workshops, Western Australia, afterwards spending a short time as a Municipal Engineer before returning to the railway service. He has been occupied in the drawing office on locomotive design, as Testing Officer & Inspector of Materials,

Mr. S. Griffiths

Assistant Works Manager, and Planning Officer. During 1953 he was employed on inspection duties and studies in England. On his return to Australia he became first Traction Superintendent and then Motive Power Engineer, a post which was subsequently redesignated to Assistant Chief Mechanical Engineer, Motive Power.

British Railways

MR. J. F. PILKINGTON, Passenger Agent, Leeds City, British Railways, North Eastern Region, has retired. He is succeeded by MR. E. BOOTH, formerly Clerk-in-Charge, Lost Property Depot, York.

MR. P. J. HENNEKER, Carriage & Wagon Works Manager, Ashford, British Railways, Southern Region, has retired.

MR. R. J. POWELL, District Operating Superintendent, Nottingham, British Railways, London Midland Region, is to retire on April 17.

MR. A. PATERSON, A.M.I.C.E., Acting District Engineer, Glasgow North, British Railways, Scottish Region, who, as recorded in our February 24 issue, has been appointed Assistant Civil Engineer, Scottish Region, was educated at Allan Glen's School and the Royal Technical College, Glasgow. He entered the service of the former London Midland & Scottish Railway, in 1931, in the Divisional Engineer's Office, Glasgow. From 1936 to 1946 he was Engineering Assistant in the New Works Department in that Office. In 1946 he was appointed Outdoor Engineering Assistant to the District Engineer, Glasgow and, in 1949, was transferred to the Chief Civil Engineer's Office, Glasgow, in the Construction Section. In 1952 he

Mr. A. Paterson

became Senior Technical Assistant to the District Engineer, Glasgow South, and, in 1953, Assistant District Engineer, Irvine. He returned to the Chief Civil Engineer's Office as Assistant, New Works (Modernisation), in 1956. From April, 1959, Mr. Paterson was Acting District Engineer, Glasgow North, although his permanent appointment was District Engineer, Irvine.

MR. P. W. GLASSBOROW, Economics Officer, Finance Department, British Transport Commission, who, as recorded in our March 3 issue has been appointed Traffic Survey & Costing Officer, Liverpool Street, British Railways, Eastern Region, was educated at Highgate School. He joined the London Passenger Transport Board, in 1936, in the department of the Chief Financial Officer. After war service with the R.A.F., Mr. Glassborow returned for a short time to the L.P.T.B. He later spent three years with a leading insurance company before becoming Actuary & Administrative Officer in the Ministry of Finance of the Sudanese Government. Mr. Glassborow is a Fellow of the Institute of Actuaries.

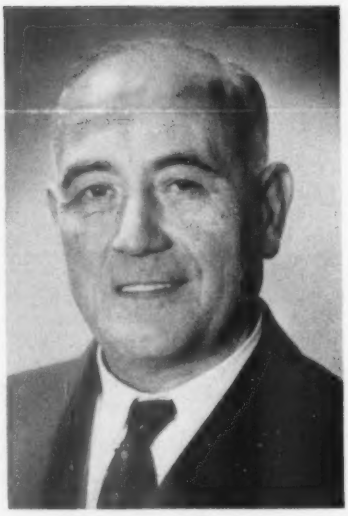
Mr. P. W. Glassborow

The London Midland Region of British Railways has announced the following appointments: MR. R. RANDALL to be Treasurer, Euston; MR. M. HARBOTTLE to be New Works Officer, Civil Engineer's Department, Euston; MR. W. BROWNLEE to be District Operating Superintendent, Liverpool (Central), and MR. T. R. CHADWICK to be District Estate Surveyor, Northern District, Preston.

MR. W. E. THOMSON, Traffic Costing Officer, London Division, British Railways, London Midland Region, who, as recorded in our March 24 issue, has been appointed Assistant Divisional Traffic Manager, Barrow, was educated at Dalziel High School, Motherwell, and joined the London Midland & Scottish Railway in Lanarkshire. During the war he served with the Royal Navy and resumed his railway service in 1947, in Glasgow, gaining experience in the Operating Department. From 1949 to 1952 he was employed in road haulage, first with a private firm, and later with British Road Services. In 1952 he was seconded to the newly formed Traffic Costing Service at the British Transport Commission, where he became an Assistant Traffic Officer, and then a Traffic Costing Officer. In 1955 he was appointed Traffic Costing Officer, Paddington and, in 1958, Traffic Costing Officer, London Division, London Midland Region, the position he now vacates.

Mr. W. E. Thomson

MR. T. W. RATCLIFFE, Assistant to Accountant, Darlington, British Railways, North Eastern Region, who, as recorded in our March 3 issue, has retired, commenced his railway service with the former Midland Railway Company in the Locomotive Accountant's Office, Derby. After war service with the Royal Navy he returned to Derby in 1919 and when the Locomotive and Carriage & Wagon Works Accounting combined, in 1932, he was appointed Head of Individual Costing, Locomotive & Carriage Repairs Section. In 1938 he was appointed Chief Accounts Clerk at Earlestown Carriage & Wagon Works and, in 1946, became Works Accountant. Mr. Ratcliffe became Works Accountant at Gorton Locomotive Works, in 1951 and, in 1953, took up a similar position at Darlington controlling all the Chief Mechanical Engineer's, the Carriage & Wagon Engineer's, and the Motive Power Superintendent's accounting offices at Darlington, York, Shildon, and Newcastle. In 1959 he was appointed to the post of Assistant to Accountant. Mr. Ratcliffe was responsible for the introduction of electronic computing machines at Darlington to mechanise and centralise the preparation of paybills for the whole of the traffic staff of the North Eastern Region.



Mr. T. W. Ratcliffe

MR. J. M. MCCALL and MR. F. W. HAWKS, Engineering Assistants, Chief Civil Engineer's Department, British Railways, Southern Region, have been elected Associate Members of the Institution of Civil Engineers.

London Transport Executive

MR. P. R. SILVERLOCK, Senior Breakdown Engineer, London Transport Executive, has been appointed Principal Executive Assistant, Running Division, Chief Mechanical Engineer's (Railways) Department, with the title of Divisional Engineer "B."

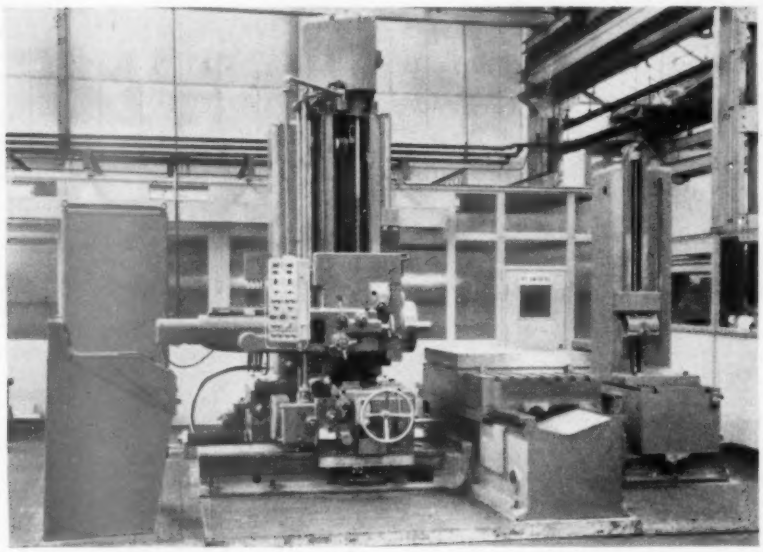
Industrial

LORD GODBER, Chairman, Shell Transport & Trading Co. Ltd., is to retire on June 30. Mr. F. J. Stephens has been elected as the new Chairman of the board.

Obituary

We regret to record the death, at the age of 64, of MR. W. D. DRUMMOND, Engineering Assistant (Bridges), Chief Civil Engineer's Department, Euston, British Railways, London Midland Region.

NEW EQUIPMENT *and Processes*



PLANER-TABLE MACHINE

The Kearns model 451P electronic planer-table-type horizontal surfacing, boring, milling, drilling, and tapping machine has been developed to take advantage of the accuracy available by using the A.E.I. co-ordinate setting system, operated by punched cards or manually by digit dials on a control desk.

The facing chuck is of a new and patented design. The drive for the radial feeds to the facing slide, passes through a substantial differential bevel-gear unit. Ball- and roller-bearings carry the high-speed members of the differential.

A large-diameter worm gear drives twin spirals, which engage with helical racks to provide the feed to the facing slide. Ensuring a balanced drive and steady radial feed, the arrangement provides racks on opposed sides of the slide. These have been sunk to their full depth and allow the chuck body to be made without slots, thereby retaining the greatest strength.

An infinitely-variable serve motor gives a direct drive through a two-speed gear box to the transverse traverse motions. When auto-positioning, the infinitely-variable serve motor is controlled down to zero speed and final control is not subject to external mechanical conditions.

These planer-table-type machines are offered with or without a boring-stay unit, which is useful for dealing with work where tail-end support is needed.

In addition to infinitely-variable feed rates available to the vertical and transverse motions, a patented feed arrangement provides a comprehensive range to the facing chuck, travelling spindle and longitudinally to the main upright with spindle slide. This gives ranges named " B " and " M " with six feeds in each. The " M " range is in inches per minute, while the " B " range is in inches per spindle revolution.

The combination of a low " M " feed with a fast spindle-feed gives a small feed per revolution, an extremely useful feature when carrying out fine-finishing operations. Both the " B " and " M " ranges can be doubled or halved, as desired, and the addition of a screw-cutting attachment adapts the " B " range to cut a large variety of threads.

Speed and accuracy combined with the ability to perform the widest possible range of operations have opened up new ways of reducing manufacturing times, and it is reported that it has been proved economical to perform additional operations on this machine which are not usually associated with a horizontal boring machine.

As well as for co-ordinate setting, the electronic system may be used for inspection.

Full information may be obtained from H. W. Kearns & Co. Ltd., Broadheath, Altrincham, Cheshire.

FUEL INJECTOR TESTER

The " Injectester Major " has been produced, by Dunedin Engineering Co. Ltd., to enable the injection system of diesel engines to be tested under working conditions.

The device, which is constructed of stainless steel to resist the corrosive action of fuels with a high sulphur content, is connected to a tee-joint in the fuel line to a cylinder. The gauge-reading reveals any adjustment which may be required to the injector and enables the individual element of the fuel pump to be balanced should this be necessary.

The device is fitted with a built-in filter and has a gauge calibrated from 0-20,000 lb. sq. in. It can be supplied with tee-pieces for application to any make of engine.

Fuller particulars are obtainable from the maker, 73, Mortimer Street, London, W.1.

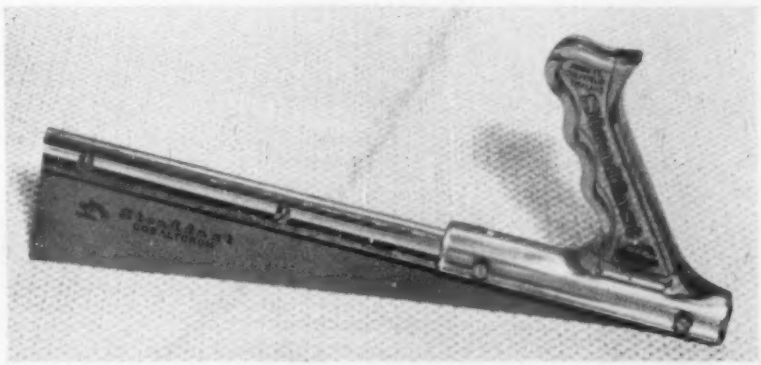
SHEET SAW

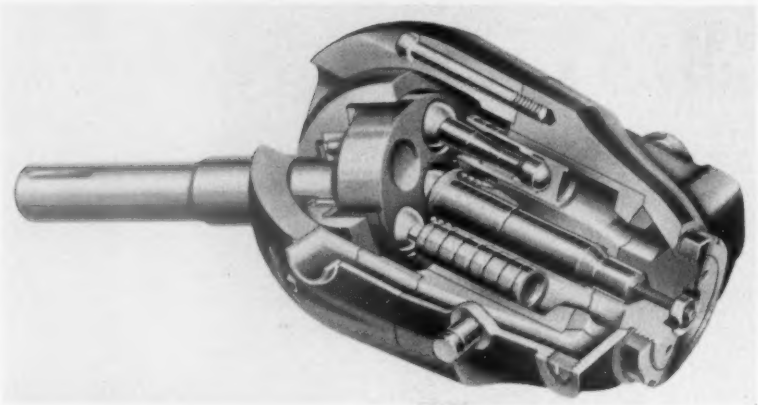
The Steadfast sheet saw has a 12-in. triangular blade of abrasion-resisting steel, held in an alloy spine to which is fitted a shatterproof plastic handle. Blades of 14 and 24 t.p.i. are available.

The saw is intended for use on asbestos, plastics, wood, and metals.

The retail price is 16s., including two blades of the pitches referred to.

Further particulars may be obtained from J. Stead & Co. Ltd., Manor Works, Cricket Inn Road, Sheffield 2.





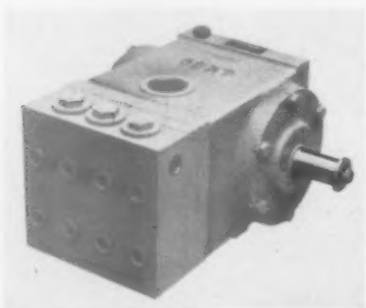
AXIAL PISTON MOTOR OR PUMP UNITS

Hydro-Titan hydraulic axial piston units, which may be used as pumps or motors, are available in 16 sizes.

As pumps, capacities available are from 3·9 g.p.m. to 2,800 g.p.m. at standard speeds of revolution. Maximum pressures are high, up to 3,500 lb. sq. in. for small units and 5,000 lb. sq. in. for the larger units, where intermittent peak pressures are required. As motors, torque ranges from 9·5 lb. sq. in. to 54,700 lb. sq. in. per 100 lb. sq. in.

The units are usually mounted in a standard housing of which two main types are available. The first allows the unit to be used as a fixed-capacity pump or motor, whereas the second type is for variable-capacity units. In the latter case several control methods are available, ranging from a simple hand-wheel to complex and exact electro-hydraulic servo-systems.

The working parts of the unit are contained in a steel body. This body can be moved through an angle relative to the shaft. Such a movement changes the stroke of the pistons and in consequence the output of the unit, if it is used as a pump, or the speed of the shaft if it is used as a motor. Variable units are completely reversible as regards oil flow or shaft direction, moreover, the units themselves can operate in any position; that shown in the lower illustration is a foot-mounted type.



Further information may be obtained on application to Keelavite Hydraulics Limited, Allesley, Warwickshire.

RADAR FAULT LOCATOR

Ferranti Limited has introduced an a.c. radar fault-locator. This will detect the position of arcing faults, ice build-up and conductor oscillation on 132 and 275 kV transmission lines, although it can also be used for higher or lower voltages. It operates on the radar principle of pulse reflection, the reflection being caused by any fault which may be due to a flash-over or to ice build-up on the line. The reflected pulses are received by the locator and displayed on a cathode ray tube for visual or automatic photographic record. The distance to the fault is found by measuring the time interval between the sending of the pulse and reception of its reflection.

The locator has been designed for easy and simple operation in manned or unmanned sub-stations, and uses the normal station battery d.c. supply, making it independent of mains voltage fluctuations.

Full particulars are available from the maker, Ferry Road, Edinburgh, 5.

COVER STRIP

The cover strip introduced by Expandite Limited is an extrusion in polyvinyl chloride, with a profile designed to ensure its retention in expansion and other joints.

These strips are intended for applications where appearance is important and, while primarily produced for walls, may be used in floors and ceilings. They are suitable for joints in concrete, reconstructed stone, or other types of masonry where an accurate joint profile is obtainable by normal building techniques.

Strip widths are available to suit joints of ½-in., ¾-in., and 1-in. width. Lengths of 15 ft. are supplied, but if it is desired to increase the length, plug connectors are supplied.

Fuller particulars are available from Expandite Limited, Chase Road, London, N.W.10.

GEAR HONING

A recently-introduced process, which is achieving great success, is the method of finishing hardened gears by gear honing. The gear hone used in this operation is basically a helical gear designed to obtain a crossed-axis relationship with the component, following the practice developed for rotary gear shaving.

The composition of the gear hone is similar to a grinding wheel in that an abrasive medium—either silicon carbide or aluminium oxide—is used, being bonded together with a plastic. Both the type and size of grit and the plastic bond can be varied to suit particular applications, but in all instances a special technique has been developed in order to ensure a self-regenerating condition. This means that as the hone is used it will gradually wear, and produce new teeth on a similar pitch diameter.

Providing a regular topping process is applied to the hone, the correct hone for the job is supplied, and the topping operation is carried out correctly, then regeneration will continue until completely new teeth have been formed on the hone body. For this reason the abrasive-impregnated portion of the hone projects well into the body of the hone to ensure that the maximum number of pieces can be obtained.

As the gear hone is a comparatively cheap tool, considering the accuracy and care with which it is manufactured, it can be readily discarded at the end of its useful life, and still have shown very worth-while economies over the previous methods of removing nicks, burrs and surface scale, from heat-treated gears.

Further details may be obtained from Charles Churchill & Co. Ltd., Coventry Rd., South Yardley, Birmingham, 25.

PIPE CALCULATOR

A slide-rule type calculator, simultaneously and quickly giving information, in connection with pipe weights and strengths, has been produced by Blundell Rules Limited.

One operation gives the weight of steel, aluminium, cast or spun iron, bronze, copper, or lead pipes when the diameter and thickness are known. A second operation enables the user to determine the value of either the bursting, test, or working pressure; the yield or stress point of material required; or the O.D. or thickness of any metal pipe when the other three values are known. Finally a set of scales gives the relative carrying capacities of pipes of different internal diameters. It is also possible to use the rule for straightforward price calculations, in addition to those of design.

Additional particulars may be obtained from the maker, Regulus Works, Lynch Lane, Weymouth, Dorset.

Questions in Parliament

U.S. Motive Power on Railways

Mr. Ellis Smith (Stoke-on-Trent—Lab.) asked the Minister of Transport on March 29 what study he had made of the experience in the United States of America of diesel and diesel-electric motive power on railways with a view to deciding the motive power policy to adopt in this country.

Mr. Marples said that the technical evaluation of experience gained in operative railway equipment was a matter for the British Transport Commission, and not for his department. In considering major proposals for investment in railway modernisation, he would take account as necessary of all information supplied to him by the Commission which was relevant to the financial results it hoped to achieve.

Mr. Ellis Smith considered that answer was not satisfactory. In America a committee composed of expert engineering motive power men had conducted a thorough investigation into the matter and decided that electrification was the best mechanical motive power.

Mr. Marples told him that these technical matters were primarily for the British Transport Commission rather than for the Minister. There were varying views on the best method of traction on the railways. In some cases electrification was good, especially where there was very dense traffic, but if the traffic was light the capital expenditure involved in electrification might very well be not worth while.

Mr. Ellis Smith then asked the Minister if he would have an investigation made into the motive power which would be the most economical for British Railways. Mr. Marples refused.

Mr. Ellis Smith went on to ask if it was correct that in the United States, Western Germany, and France they had already conducted an investigation of the kind suggested and whether Britain should be having another look at the matter in order that the railways could be run in the most economic manner.

Mr. Marples explained that the British Transport Commission had taken notice of all the experiments which had been carried out abroad.

Manufacture of Rolling Stock

Mr. Martin McLaren (Bristol N.W.—Con.) asked the Minister of Transport on March 28 to what extent it was the policy of Her Majesty's Government that the proposed British Railways Board should manufacture all its own locomotives and rolling stock.

Mr. Marples, in a written answer, said at this stage it was envisaged only that the Railways Board should be given, like the British Transport Commission, the statutory power to manufacture. It is too soon to say how far this power would be exercised.

Loading and Unloading of Mail Trains

Mr. H. Boardman (Leigh—Lab.) asked the Postmaster-General on March 29 what consultation he had had with the British Transport Commission in order to achieve speedier loading and unloading of mail and parcels at intermediate stations on main line train services.

Miss M. Pike, Assistant Postmaster-General, in a written answer, said that Post Office officials, with those of the British Transport Commission, were currently examining, in the light of the railway modernisation programme, ways and means of speeding up generally the loading and unloading of mails.

CONTRACTS & TENDERS

The London Transport Executive has been informed officially that the Birmingham Railway Carriage & Wagon Co. Ltd., do not propose to carry out its contract for the construction of tube rolling stock. Details of this contract may be found on page 433 of our October 7, 1960 issue. The terms on which this withdrawal will be agreed are under negotiation.

British Railways, North Eastern Region, have placed the following contracts:—

Wellerman Bros.: reconstruction of superstructure of road bridges No. 149, Wood Lane, Sowerby Bridge, and No. 173, Lillands Avenue, Brighouse

Pavior Construction Co. Ltd.: part resurfacing of roadways in bitumen macadam at Leeds Wellington Street goods depot

Ibmac Limited: construction of roadway at Sand Lane level crossing, Riccall

Cairns (Newcastle) Limited: provision of a vacuum brake testing installation, including pipework, valves and couplings, at Bradford Valley goods depot

R. E. Coleman Limited: construction of new office accommodation at Consett goods depot, Co. Durham

D. Crouch (Contractors) Limited: earthworks, drainage and ballasting to south departure sidings, Lamesley new marshalling yard

Durham Steelwork Limited: supply of steelwork for bridge No. 40, Bishopthorpe, on the East Coast main line south of York

Plasser and Theurer: supply and delivery of two track tamping, lifting and levelling machines for the Chief Civil Engineer's Department, York

T. C. Wild (Machinery) Limited: supply of plate bending rolls for Darlington North Road locomotive works

Conveyance Fork Trucks Limited: supply of fork-lift truck for Darlington North Road locomotive works

Firth Blakeley Sons & Co. Ltd.: supply and erection of mobile diesel fuelling installation at Leeds Holbeck motive power depot

Tarmac Roadstone Limited: erection of lineside concrete posts and panel fencing between Middlesbrough and Newport

F. & J. Watkinson: erection of new staff amenity block at Low Moor, Bradford, fork carriage sidings

Berwick Building Company: construction of new signalbox at Belford Station, Northumberland

Hilmor, Limited: supply of a compression bending machine and associated equipment for the Locomotive Carriage & Wagon Development Unit, Stooperdale, Darlington

W. Richardson & Co. Ltd.: supply and erection of a single cell wood waste incinerator incorporating a water heater for the Chief Civil Engineer's workshops at Darlington Park Lane.

British Railways, Southern Region, has placed the following contracts:—

Caffin & Co. Ltd.: strengthening of arches No. 169, 170, and 171, at Charing Cross

J. B. Edwards & Co. Ltd.: new store building and carriage cleaning staging at Coulsdon North

Aubrey Watson Limited: remedial works to slip at Penge East

Truett & Steel Limited: new staff accommodation and telephone exchange at Norwood Junction

Winter & King Limited: reconstruction

Part of the new Warerite press at the Tyseley, Birmingham, works of Bakelite Limited, mentioned on page 407

of platform buildings and roofing at New Malden

Maurice Hill Limited: re-roofing of block " H " at Eastleigh Carriage Works

R. Corben & Son Ltd.: station alterations for extension of electrification at Maidstone East

R. Corben & Son Ltd.: extension of platform and roofing for extension of electrification at Folkestone Harbour.

Davey, Paxman & Co. Ltd., has received an order from Ruston & Hornsby (Australia) Pty. Ltd., for four 12-cylinder YHX engines to be installed in locomotives to be built by Tulloch Limited, of Sydney. The locomotives will be of the 800 h.p. double bogie type, using Krupp hydraulic transmission.

Grant, Lyon & Co. Ltd., a member of the Chamberlain Group of Companies, in association with Paterson Engineering Co. Ltd., have been successful in securing an order for four special rail tracks to be used in two new factories in Russia.

BOARD OF TRADE

The Export Services Branch, Board of Trade, has received calls for tenders as follow:—

From India:

2 mould stoves.

The issuing authority is the Deputy Chief Mechanical Engineer, Steel Foundry, C.L.W., Chittaranjan, West Bengal, to whom bids should be sent. The tender No. is SFM-60/00/08. The closing date is June 12, 1961. The Board of Trade reference is ESB/10410/61. No further information is available at the Board of Trade.

From the Philippines:

12 liners, brake shoe, part No. M-17081, 4-oz. each for Buda Cars

200 sacks bolts, track, W/USS square nuts, ¾ in. x 4 in. ASCE, in 100-lb. sacks

500 sacks bolts, track, w/square nuts, ¾ in. x 4½ in. in 100-lb. sacks

1,000 sacks spikes, track, ⅝ in. x 4½ in., in 100-lb. sacks.

The issuing authority is the Purchasing Agent, Manila Railroad Company. Bids should be sent to General Manager, Manila Railroad Company, Manila. The tender No. is 13. The closing date is April 14, 1961. The Board of Trade reference is ESB/11196/61.

From Pakistan :

590 axle boxes C.S. machined with face plates 10 in. x 5 in. or 5½ in. x 7½ in. x 2¼ in. groove (B.G.) to IRS drg. No. WA/570 and WA/581 (alt 6) part. drg. No. W/507(6), W/566(3), W567, W-569(4), W-570 (alt 6), W-1601, and W-1602 and PRSS No. R7 and M5.

The issuing authority is the Chief Controller of Stores, Pakistan Eastern Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P5/ACST/EBI/29/60. The closing date is April 24, 1961. The Board of Trade reference is ESB/11180/61.

700 rft. steel casing pipe for tube-well 12 in. dia.

2,000 rft. steel pipe for tube-well 10 in. dia.

The issuing authority is the Chief Controller of Stores, Pakistan Eastern Railway, Pahartali, Chittagong, to whom bids should be sent. The tender No. is P7/B/108/60. The closing date is April 22, 1961. Local representation is considered desirable. The Board of Trade reference is ESB/11183/61.

Further details relating to the above tenders together with photo-copies of tender documents, unless otherwise stated, can be obtained from the Branch (Lacon House, Theobald's Road, W.C.1).

NOTES AND NEWS

Price reduction. The U.K. price of Cold-Cure Silastomer is down by approximately 5 per cent, depending on quantity. This product is made by Midland Silicones Limited.

Exhibition information centre. The stand of the British Engineers' Association, at the forthcoming Engineering, Marine, Welding & Nuclear Energy Exhibition, to be held at Olympia, will serve as the engineering information centre for the exhibition.

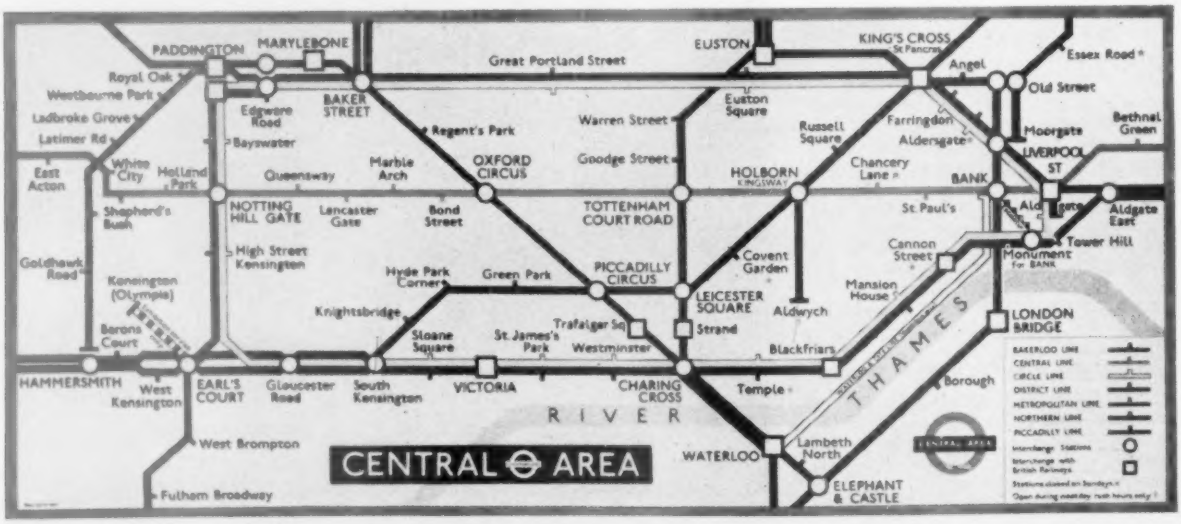
North Eastern " Day-Line " tickets. " Day-Line " tickets are again being offered by the North Eastern Region of British Railways. Brochures giving details and suggestions for tours are available.

Institute of Transport informal luncheon. The Institute of Transport informal luncheon on April 25, will be held at the Connaught Rooms, Great Queen Street, W.C.2, at 12.15 for 1 p.m. The address will be given by Mr. T. G. Gibb, Chairman, Board of Management, British Road Services. Reservations should be made not later than April 21.

Institute of Transport South Wales & Monmouthshire Section annual dinner. The annual dinner of the South Wales & Monmouthshire Section of the Institute of Transport took place at the Angel Hotel, Cardiff, on March 27, 1961. The President of the Institute, Mr. K. W. C. Grand, responded to the toast " The Institute of Transport " proposed by Mr. F. Blaise Gillie. The toast " Our Guests " was proposed by Mr. Leonard Price, Chairman-Elect of the Section, and the Lord Mayor of Cardiff, Alderman Mrs. Dorothy Lewis, responded. Mr. Sydney T. Evans, Chairman of the Section, presided.

Rolls-Royce in Australia. Rolls-Royce Limited is to invest £A750,000 (£600,000) initially on the service, assembly, and later, manufacture of diesel engines in Sydney.

New-style Underground map for trains. To help Underground passengers to find their way more easily in central London, a new-style map covering the whole of the in-town portion of the system is being introduced by the London Transport Executive



Underground map to be displayed in all London Transport Executive trains

and will be displayed in all trains. The map covers all stations in an area between Paddington, Aldgate, Waterloo and Hammersmith. It will be shown in all Underground cars alongside the present route diagrams which cover individual lines only. All interchange points between different lines and with main line terminals are clearly marked and the complete Circle line is included. Nearly 80 inner London Underground stations are shown.

Tube cutting by machine. The British Oxygen Co. Ltd. report that the use of their Alyn Mark I tube-cutting machines, by Birwelco Limited, has resulted in the work being done seven times faster than formerly. The machine is employed on preparing flange-weld necks, which formerly involved hand cutting and grinding.

West of India Portuguese Railway. The West of India Portuguese Railway and Mormugao Harbour have been taken over from the West of India Portuguese Guaranteed Railway Co. Ltd. by the Junta Autonoma dos Portos e Caminho de Ferro do Estado da India, a board formed by the Portuguese Government, as from March 31, 1961. The West of India Portuguese Railway and Mormugao Harbour will be operated by the Junta from April 1 last.

Special metals at Moscow fair. Special metals and products, and their various applications, will be exhibited by Telcon Metals Limited on their stand at the forthcoming Moscow Trade Fair. This Company is a member of the British Insulated Callender's Cables Limited group of companies. Thomas Bolton & Sons Limited, and Connollys (Blackley) Limited, both members of the B.I.C.C. group, will also be represented on the Telcon Metals stand.

Rapier crane at Leipzig. The Rapier "1520" mobile crane, exhibited at the Leipzig Spring Fair by Ransomes & Rapier Limited, has been sold to the German Democratic Republic. This model, which loads up to 15 tons, was referred to on page 343 of our March 24 issue.

Trade delegation. A trade delegation jointly sponsored by the Board of Trade and the Federation of British Industries and organised by the latter body, will leave the U.K. on April 11 to visit seven countries in South-East Asia, under the chairmanship of Sir Edward Thompson. The delegation will work through four simultaneous missions. After tours lasting a fortnight, it will meet in Singapore for a two-day conference with H.M. trade representatives accredited to all the countries concerned.

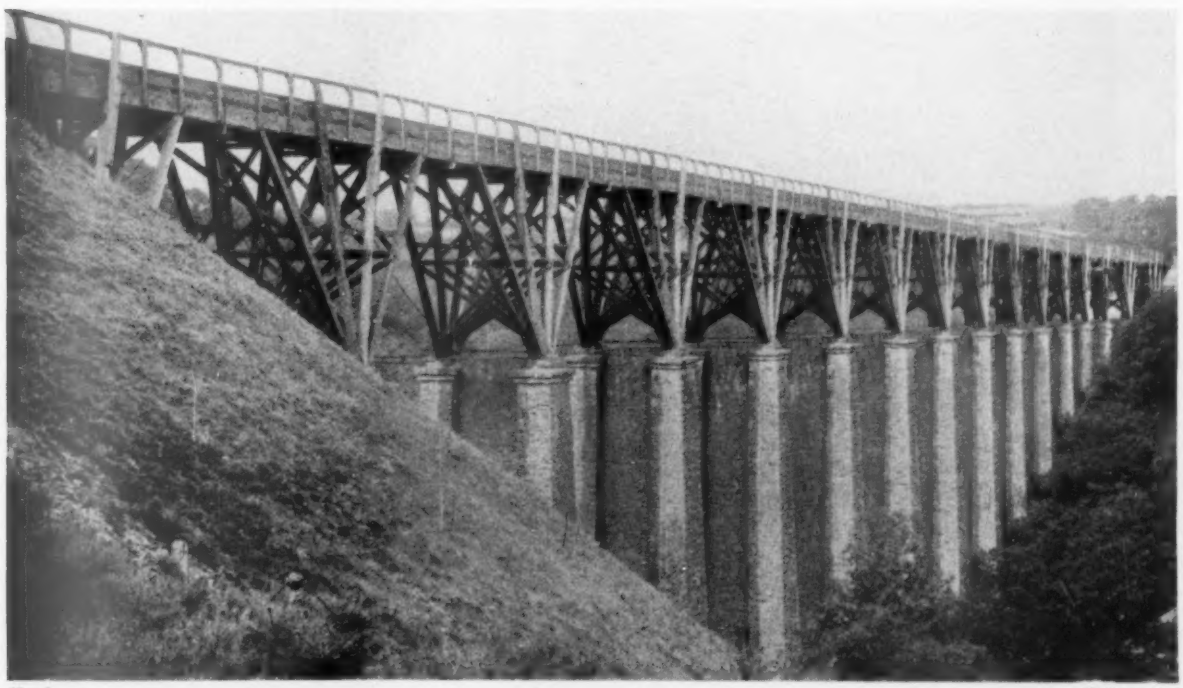
"Special" for Canadian tourists. On March 29, the Eastern Region of British Railways provided a special sleeping car train from Kings Cross. The train conveyed a party of more than 230 Canadian visitors, on a 12-day visit to the British Isles, to Scotland. The trip was organised by Corson Travel Service Incorporated, Toronto, in conjunction with British & Irish Railways Incorporated, also of Toronto.

Larger Warerite sheets. New units of manufacturing equipment, recently incorporated in the Tyseley plant of Bakelite Limited, have enabled Warerite decorative laminated plastics to be produced in sheets up to 10 ft. x 4 ft. Sheets 3 ft. wide are also now in production. The Tyseley plant is automatically controlled and designed to manufacture high-pressure laminates incorporating phenolic-resin core and melamine surfacing. Plain colours are not yet available in the new large sheets, but it is hoped to produce them at a very early date.

Weed-control convention. Last month, railway engineers from eight European countries discussed the use of substituted urea herbicides in the control of weeds on railways. The convention was organised at Geneva by Du Pont de Nemours International S.A. Papers covered cost advantages of chemical weed control, planning weed-control programmes, the organisation of railway weed-killer trials and new equipment for on- and off-track application of herbicides.

Open forum in the Eastern Region. On April 19, at 7.45 p.m. in the Moot Hall, Colchester, the Great Eastern Line of the Eastern Region of British Railways will hold its first open forum. Presiding will be Mr. W. G. Thorpe, Line Traffic Manager (Great Eastern). The panel, headed by Mr. H. W. Few, Traffic Manager (Liverpool Street), will comprise Mr. H. Kinsey, Mr. G. M. Booth (District Commercial Officers) and Mr. R. H. N. Hardy, District Running & Maintenance Officer. The Mayor of Colchester, Councillor Ivor Brown, will also attend the meeting.

Trent Motor Traction. At the 48th Annual General Meeting of the Trent Motor Traction Co. Ltd. on March 29, Mr. R. J. Ellery, Chairman, said the year's traffic had been affected by bad weather and excursion carryings were well down. Business on extended tours had been very good—4,657 passengers had used the new luxury coaches, and two new tours—the 13-day tour of Scotland and the five-day tour of North Devon—had proved



Photo] *[B.R. Archives*

Walkham viaduct on the Launceston branch, showing Kyanised preserved timbers (see "Letters to the Editor" this issue)

very popular. Prospects were good; the programme had been revised, and new interests added. Bookings were going well To meet increased costs arising from higher wages, fares had been raised on June 28.

Railway Stock Market

Business in stock markets has again improved with more reassuring international news, and values in most sections tended higher. Sentiment was not affected by the growing City view that the Budget is unlikely to bring any major tax concessions, though hopes persist of some relief for surtax payers.

In foreign rails, Antofagasta stocks have been firmer, with the ordinary 16¼ and the preference 35½. Chilean Northern 5 per cent debentures marked 57¼ and Costa Rica ordinary stock changed hands around 41½ and the 6½ per cent debentures at 97.

United of Havana second income stock remained at 6¼, and business in Brazil Railway bonds ranged from 4½ to 5¼. Salvador Railway consolidated stock changed hands down to 2 and the income stock down to 11. Paraguay Central 6 per cent debentures changed hands at 17¾. Midi 4 per cent sterling bonds remained at 85½. Mexican Central "A" bearer debentures were again 61, and San Paulo Railway 3s. units 1s. 2¼d.

Canadian Pacifics moved lower on balance at $44, at which the yield is over 6 per cent. The 4 per cent preference stock was 60¼ and the 4 per cent debentures 58¼. White Pass shares were $10½.

Among shares of locomotive builders, engineers and allied companies, activity continued in Birmingham Wagon, which rose afresh from 30s. to 33s. on vague talk of merger possibilities. North British Loco were 8s. 1½d., G. D. Peters 20s. and Wagon Repairs 5s. shares were maintained at 19s., and Gloucester Wagon 10s. shares strengthened to 10s. 9d. Westinghouse Brake were 40s. 9d., Charles Roberts 5s. shares were 8s. 1½d. and Beyer Peacock 5s. shares rose to 7s. 6d.

Machine tool shares have received more attention with Alfred Herbert higher at 70s. 3d. on further consideration of the annual statement of the Chairman. Coventry Gauge 10s. shares were 30s. 3d. Craven Bros. 5s. shares 12s. 1½d. and elsewhere, Broom & Wade 5s. shares moved higher at 27s. 6d.

In electricals, A.E.I. eased to 45s., G.E.C. were 36s. 3d. and English Electric 37s. 6d. B.I. Cables firmed up to 57s. and Johnson & Phillips were 21s.

Dowty Group 10s. shares rallied strongly to 40s. and Pressed Steel 5s. shares have been firmer at 32s. 6d. Activity continued in Leyland Motors up to 90s. Buyers have been about for Clarke Chapman, which rose on balance from 49s. 9d. to 54s. 3d., but further profit-taking put Babcock & Wilcox back from 35s. 6d. to 34s. 3d. and Stone-Platt reacted 1s. to 66s. Vickers at 32s. 1½d. lost a few pence on balance, and Ruston & Hornsby came back 1s. 3d. to 28s. T. W. Ward attracted more attention and at 77s. 6d. moved higher on balance. Tube Investments were 83s., Mather & Platt 45s. and Hopkinsons 131s. 3d.; British Oxygen 5s. shares strengthened to 32s. 9d. Ransome & Marles 5s. shares have been firm at 23s. and Pollard Bearing 4s. shares at 38s. 9d.

Forthcoming Meetings

April 7 (*Fri.*). The Railway Club, 7 p.m. at The Royal Scottish Corporation, Fetter Lane, E.C.4. "Signalman's society," Mr. P. Broadley.

April 8 (*Sat.*). The Stephenson Locomotive Society, at 32 Russell Road, Kensington, W.14, at 2.30 p.m. Annual general meeting.

April 8-10 (*Sat.-Mon.*). Railway Students' Association. Week-end visit to South Wales.

April 9 (Sun.). Railway Correspondence & Travel Society visit to Swindon Works. Special train leaves Paddington at 9.15 a.m.

April 10 (*Mon.*). The Historical Model Railway Society, at Keen House, Calshot Street, N.1, at 7 p.m. "Transport treasures," Mr. J. H. Scholes.

April 10 (*Mon.*). The Institute of Transport, Darlington Group, at United House, Grange Road, at 7 p.m. "The Type '2' diesel-electric locomotive," Mr. J. S. Scott.

April 10 (*Mon.*). The Institute of Transport, East Anglia Section, at the offices of the Eastern Counties Omnibus Co. Ltd., Norwich, "Some thoughts on the problems of transport rates," Mr. L. A. Carey.

April 10 (*Mon.*). The Institute of Transport, London Section, at the Institute of Marine Engineers, Mark Lane, E.C.3, at 5.30 p.m. Annual Shipping lecture, Mr. T.S. Wilding. Admission by ticket only.

April 11 (*Tue.*), The Institute of Transport, Midland Section, at the Engineering Centre, Birmingham, at 6.30 p.m. Annual general meeting followed by a display of films.

April 11 (*Tue.*). The Institute of Transport, North Western Section, at the Gas Service Centre, Manchester, at 6.15 p.m. Annual general meeting.

April 11 (*Tue.*). The Institute of Transport, Yorkshire Section, at the Griffin Hotel, Leeds, at 6.30 p.m. Annual general meeting and film display.

April 11 (*Tue.*). Institution of Railway Signal Engineers, at Savoy Place, W.C.2, at 6 p.m. Annual general meeting. Chairman's address.

April 11 (*Tue.*). The Institution of Civil Engineers, at Great George Street, Westminster, S.W.1, at 5.30 p.m. "Recent works on the canal system of the B.T.C. and planning for the future," Mr. V. H. Tripp.

April 12 (*Wed.*). The Institute of Transport, South Western Section, at Oldway Mansion, Paignton, at 7 p.m. "The Tamar bridge project," Mr. K. Anderson.

April 12 (*Wed.*). The Institute of Transport, Southern Section, at the Harbour Board Offices, Southampton, at 5.45 p.m. Annual general meeting.

April 13 (*Thur.*). Diesel Engineers & Users Association, at the Connaught Rooms, London. Annual luncheon.

April 13 (*Thu.*). The Institute of Transport, Northern Ireland Section, at Belfast Castle, annual dinner and visit of the President.

April 14 (*Fri.*). The Institute of Transport, Northern Section, at the Royal Station Hotel, Newcastle, at 7 p.m. Annual general meeting.

April 14 (*Fri.*). The Institute of Transport, Swindon Group, at the Engineering Society's Rooms, Emlyn Square, at 7.15 p.m. Annual general meeting.

April 15 (*Sat.*). The Stephenson Locomotive Society, North Stafford & Cromford & High Peak rail tour.

April 15 (*Sat.*). Talyllyn Railway Preservation Society, North-West Area. Annual reunion at the Memorial Hall, Albert Square, Manchester, at 2 p.m.

April 15 (*Sat.*). The Historical Model Railway Society, at 2 p.m. Visit to B.T.C. museum at Clapham.

April 15 (*Sat.*). The Railway & Canal Historical Society, North-eastern and North-western groups joint visit to Standedge tunnel.

April 18 (*Tue.*). The Institution of Locomotive Engineers, at the Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1, at 5.30 p.m. Annual general meeting followed by an ordinary general meeting, at which a paper will be presented entitled "Work study and its application to motive power activities," Mr. G. O. B. Clarke, and Mr. W. G. F. Thorley.

April 22 (*Sat.*). The Stephenson Locomotive Society, High Peak rail tour.

April 24 (*Mon.*). The Institution of Railway Signal Engineers, at Savoy Place, W.C.2, at 6 p.m. Annual general meeting.

April 29 (*Sat.*). Railway Correspondence & Travel Society, East Midlands Branch, Vale of Belvoir tour. Special train leaves Nottingham Midland at 1.40 p.m.

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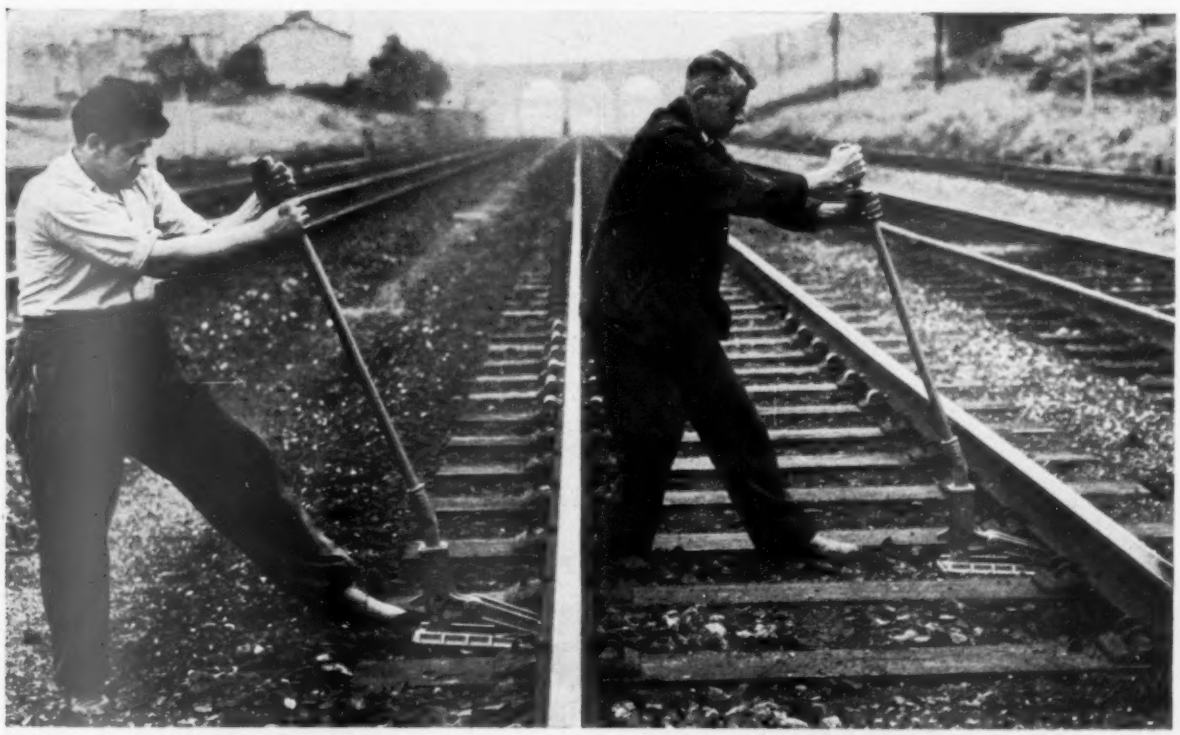

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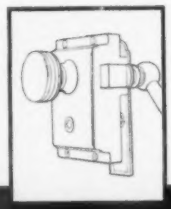

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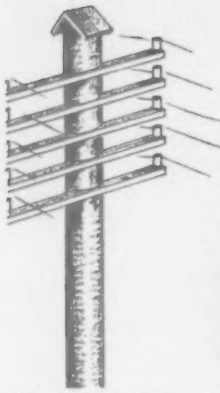

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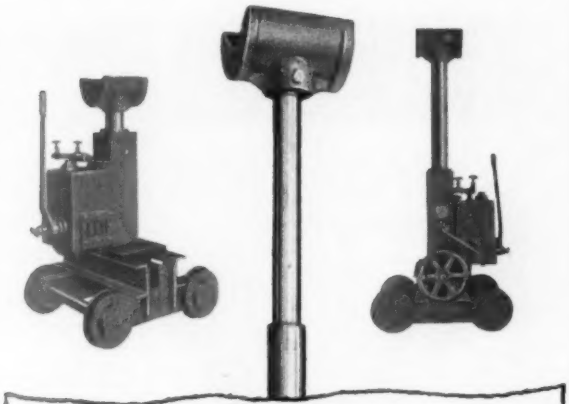

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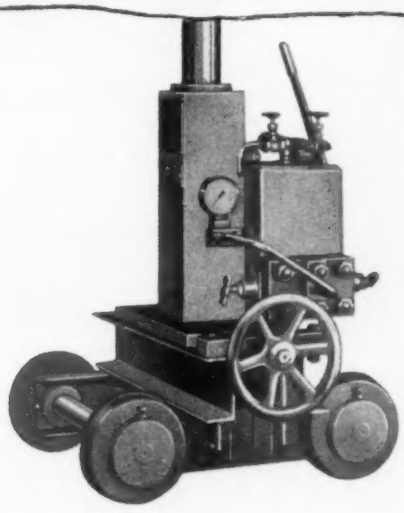

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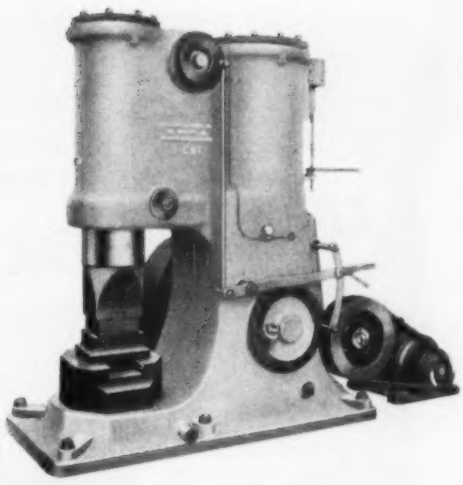

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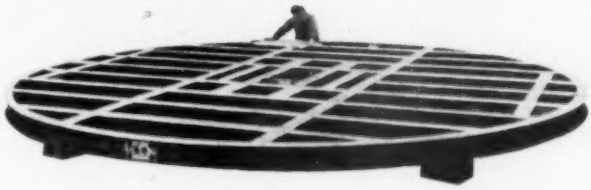

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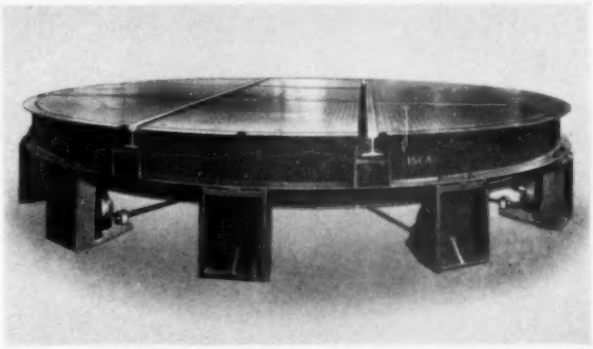

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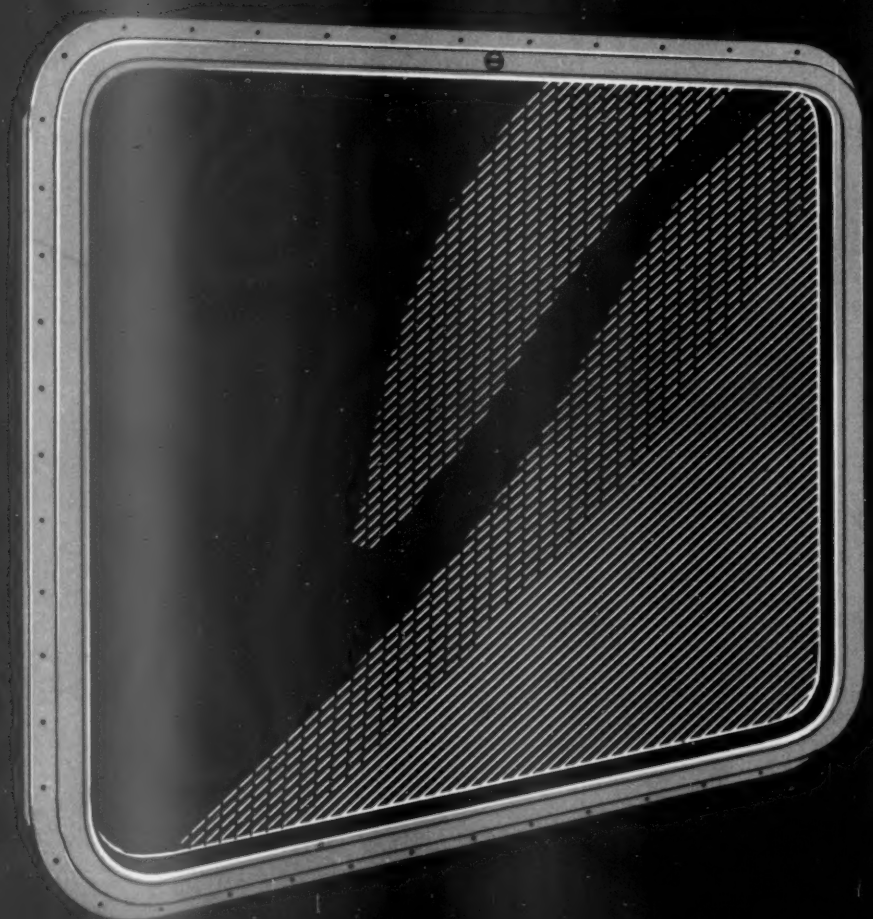

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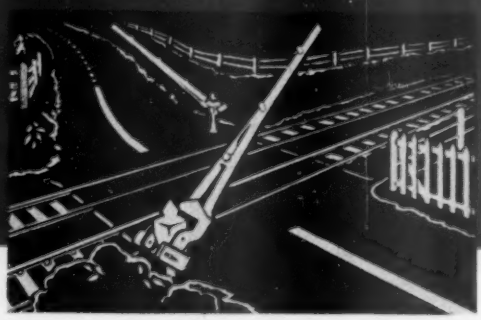

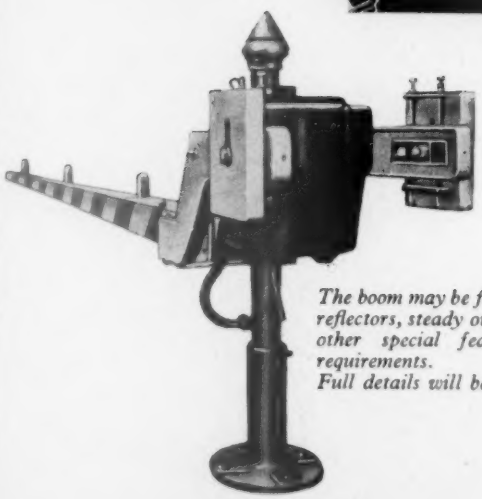

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